Collaborative Writing and Publishing with LaTeX

(or 'How to lay out your manuscripts, theses and reports like a pro')

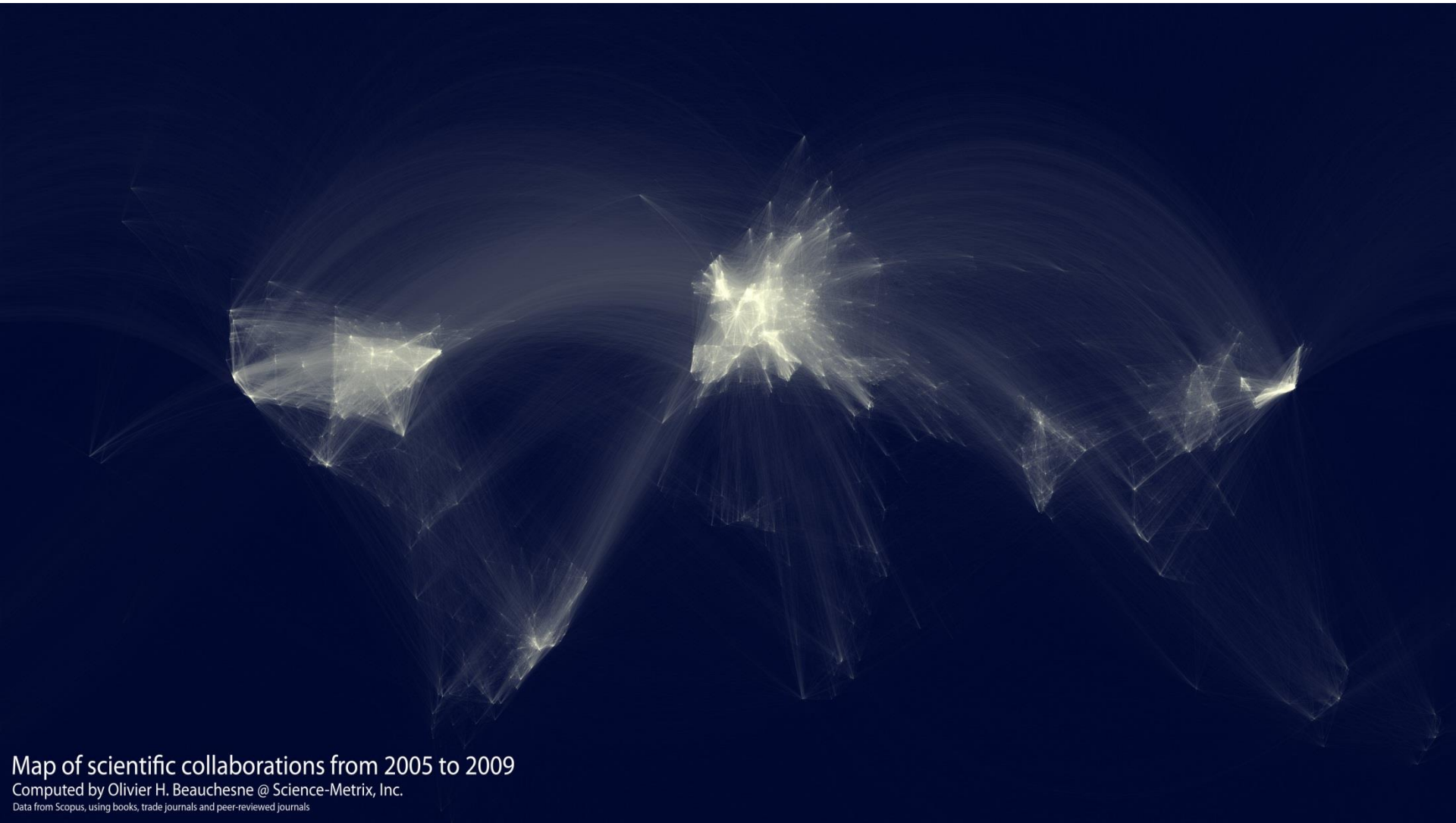
www.overleaf.com | @DrHammersley

Workshop Overview

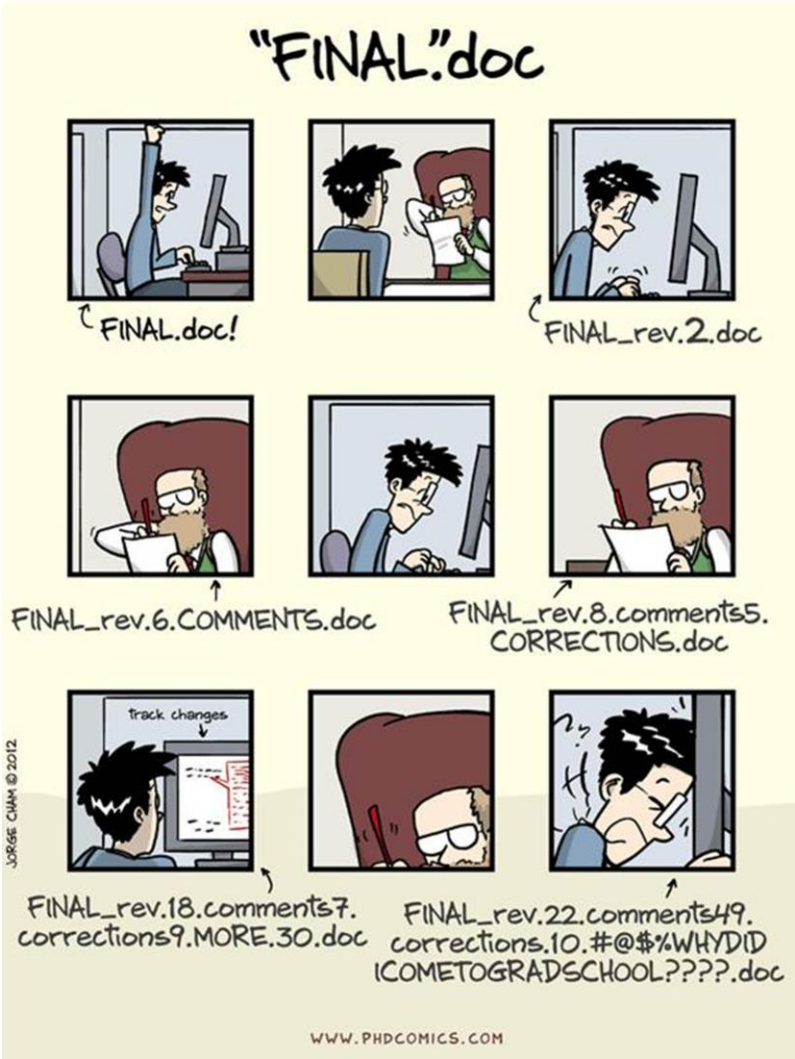
- An Introduction to Overleaf and LaTeX
- Getting started with LaTeX templates
- Getting more out of LaTeX & Overleaf - features including Mendeley, Git and Plot.ly integrations, and easy table creation and symbol lookup.

Overleaf

The internet is transforming research…



…but writing up is still painful



Some of the problems…

- Long email chains passing files around;
- Dealing with multiple versions of the same document;
- Hours spent formatting & typesetting;

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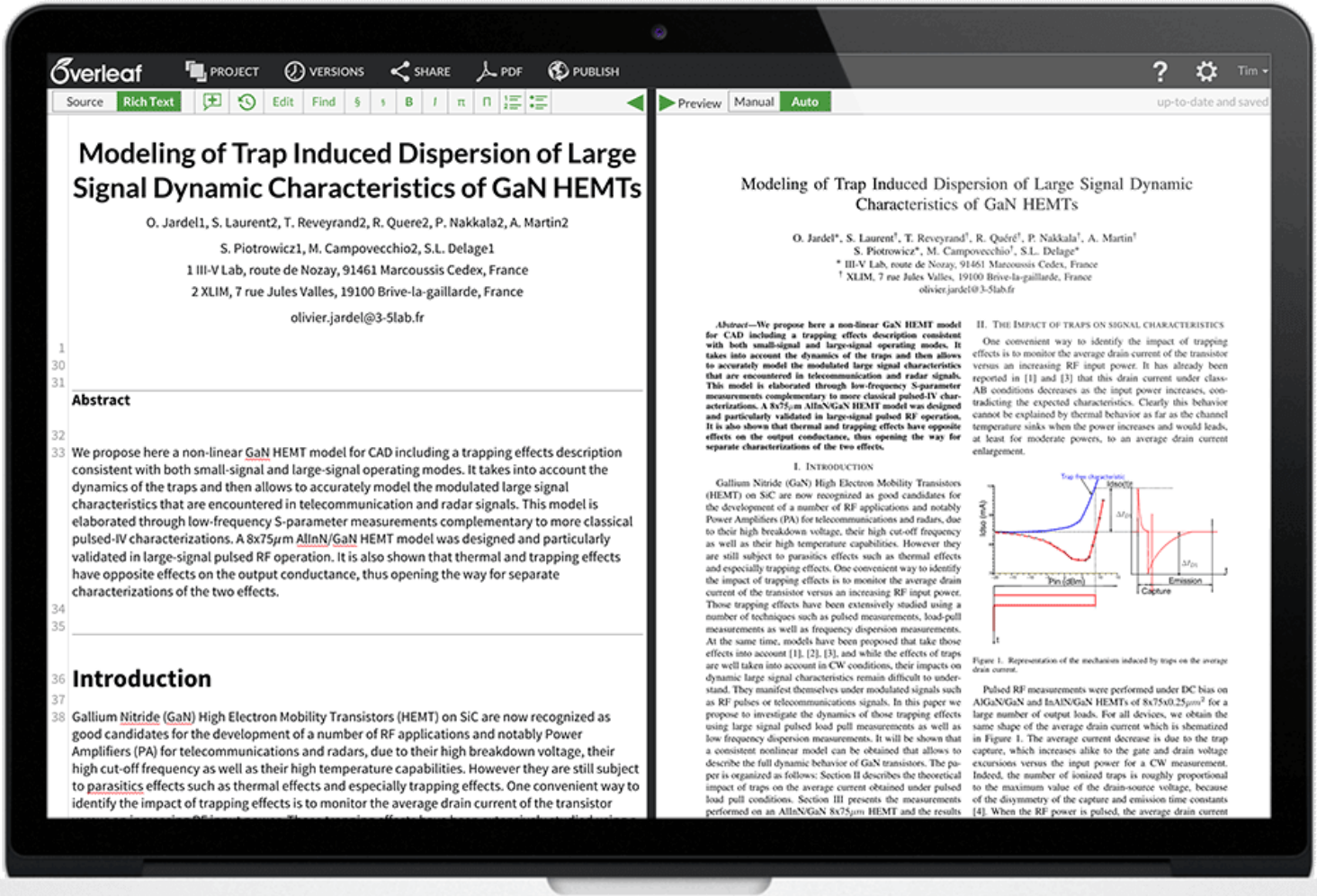
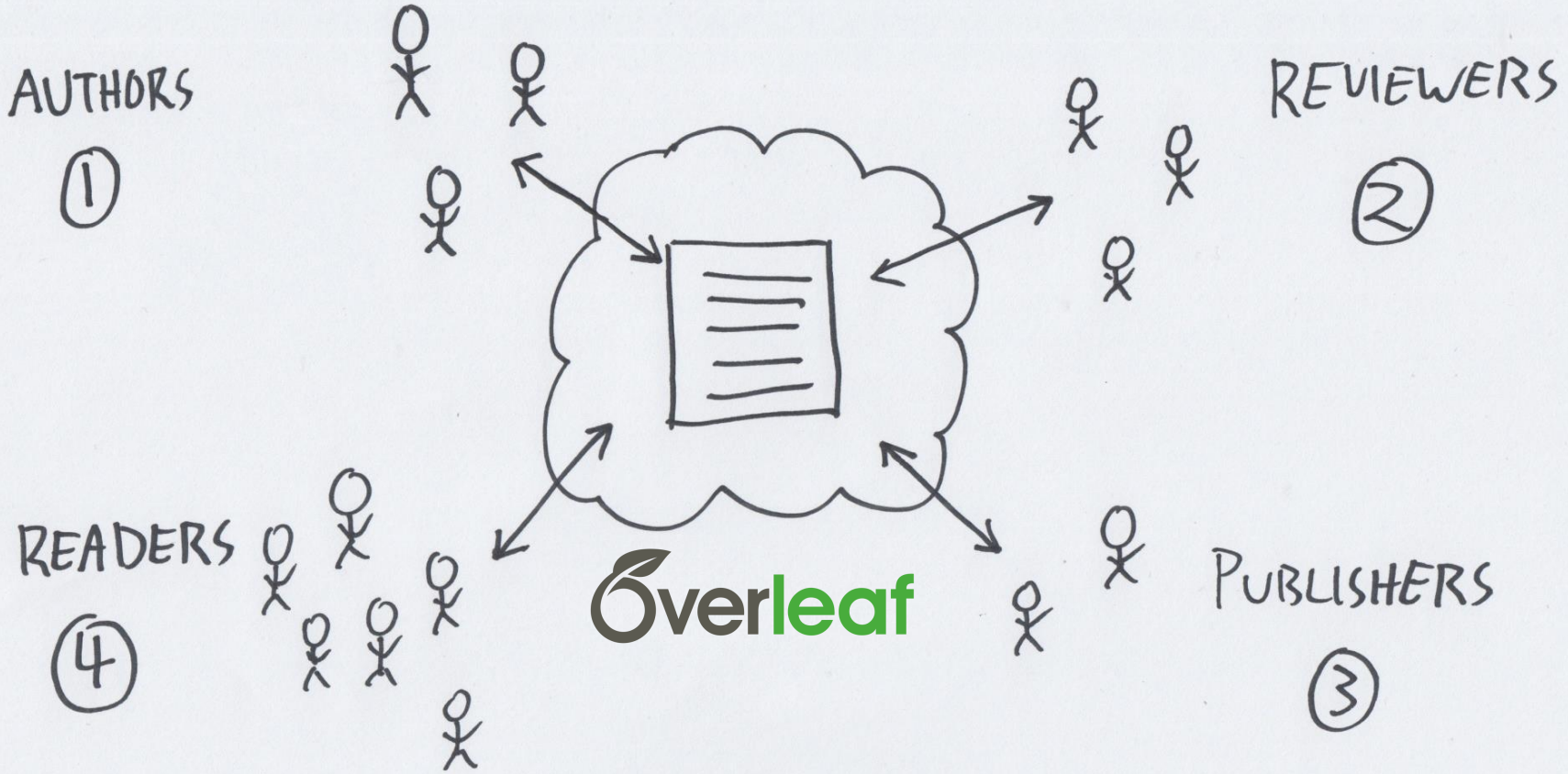
Overleaf – an online collaborative writing platform

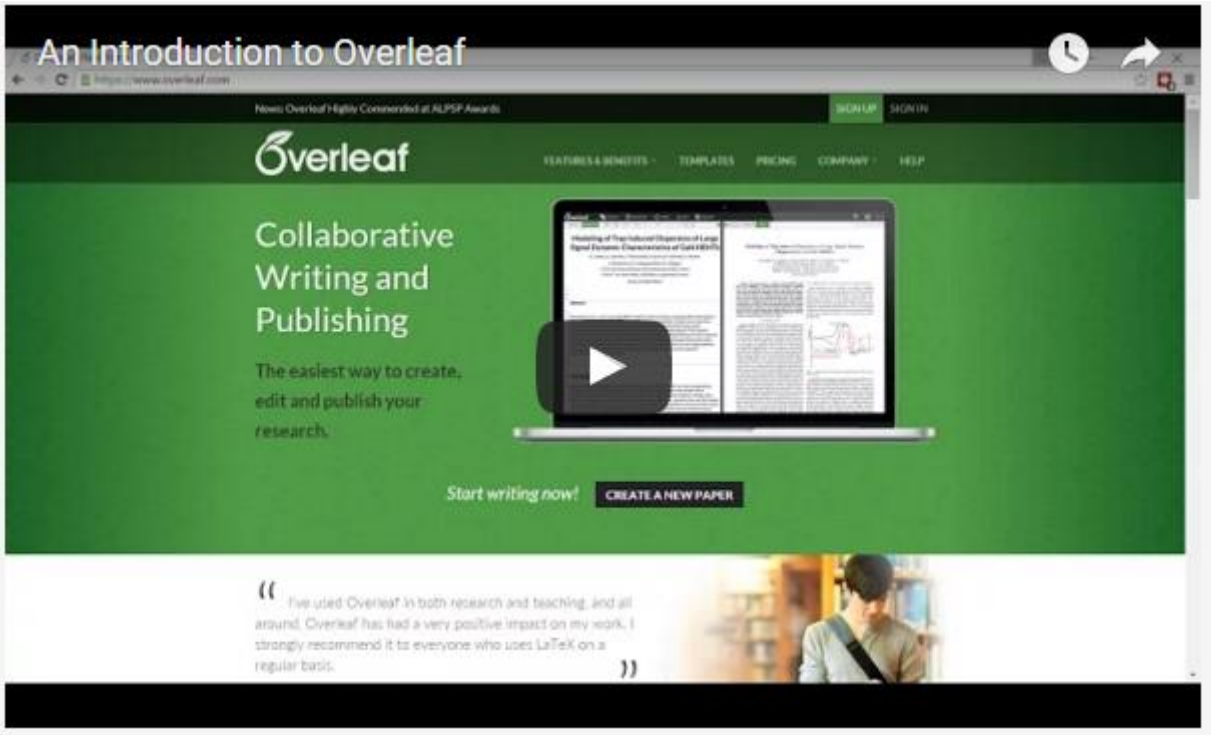



AUTHORS
1
REVIEWERS
2
READERS
4
PUBLISHERS
3
Overleaf

Online collaborative editing tools provide…

- No need to email files – simply send the link;
- One version of the document, accessible by all collaborators;
- Typesetting is done automatically in the background whilst you type (via LaTeX);

Overleaf



https://www.overleaf.com/tutorial

Why LaTeX?

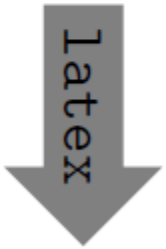
- It makes beautiful documents
  - It's easy to spot a LaTeX document in a pile of Word docs
- It was created by scientists, for scientists
  - A large and active community
- It is powerful | you can extend it
  - Packages for papers, presentations, spreadsheets, . . .

Overleaf

How does it work?

- You write your document in `plain text` with `commands` that describe its structure and meaning.
- The `latex` program processes your text and commands to produce a beautifully formatted document.

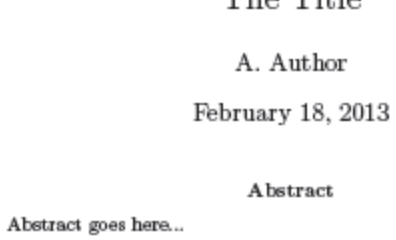
```
The rain in Spain falls \emph{mainly} on the plain.
```



The rain in Spain falls *mainly* on the plain.

- Tell LaTeX the `\title` and `\author` names in the preamble.
- Then use `\maketitle` in the document to actually create the title.
- Use the `abstract` environment to make an abstract.

```
\documentclass{article}

\title{The Title}

\author{A. Author}

\date{\today}

\begin{document}
\maketitle

\begin{abstract}
Abstract goes here...
\end{abstract}

\end{document}
```



But it can start to get complicated….

```
\begin{itemize}
\item Tea
\item Milk
\item Biscuits
\end{itemize}
```

- Tea
- Milk
- Biscuits

```
\begin{figure}
\includegraphics{chick}
\end{figure}
```

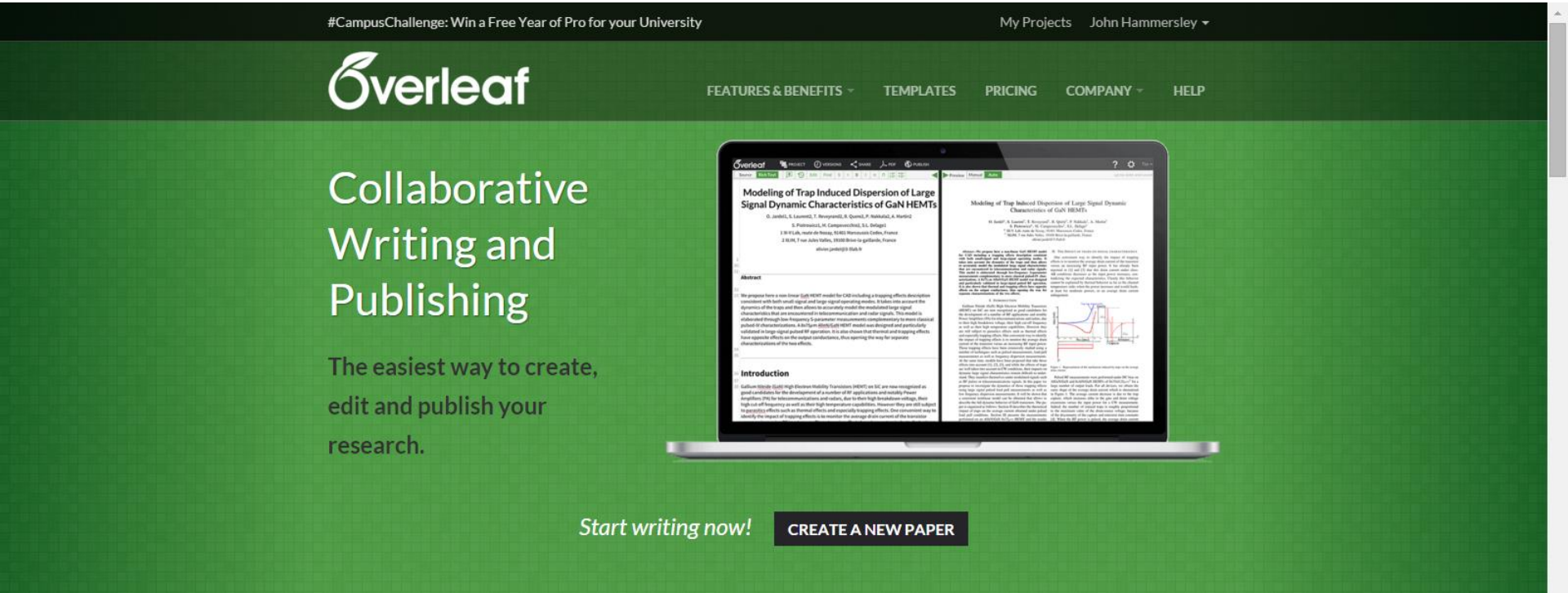
```
\begin{equation}
\alpha + \beta + 1
\end{equation}
```

$$\alpha + \beta + 1 \quad (1)$$

https://www.overleaf.com/latex/learn/free-online-introduction-to-latex-part-1

Making it easier…

- Cloud-based tools provides LaTeX in your browser
- There's nothing to download or install
- Access your projects from anywhere, any device



Choose from over 2000 different templates

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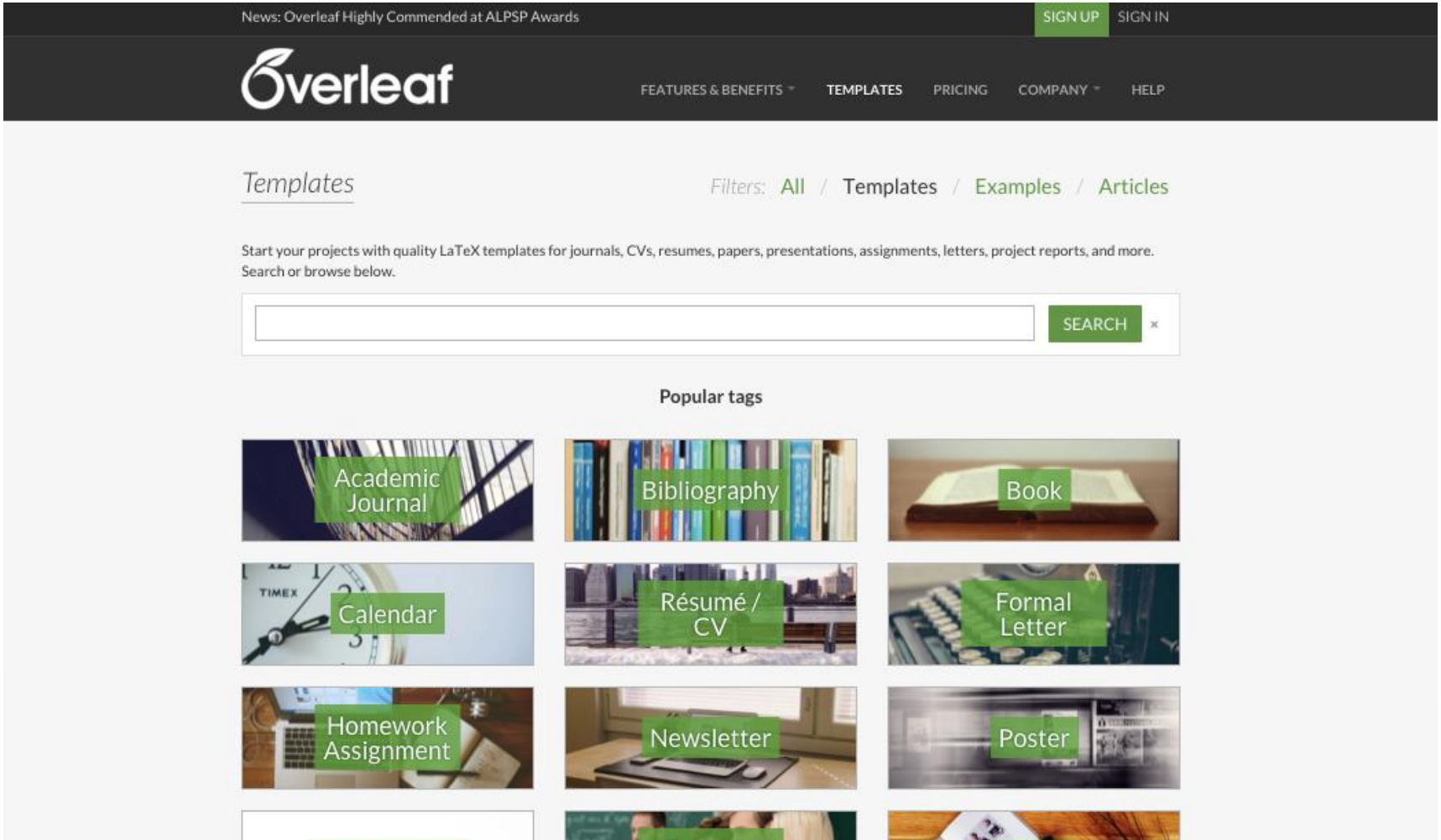
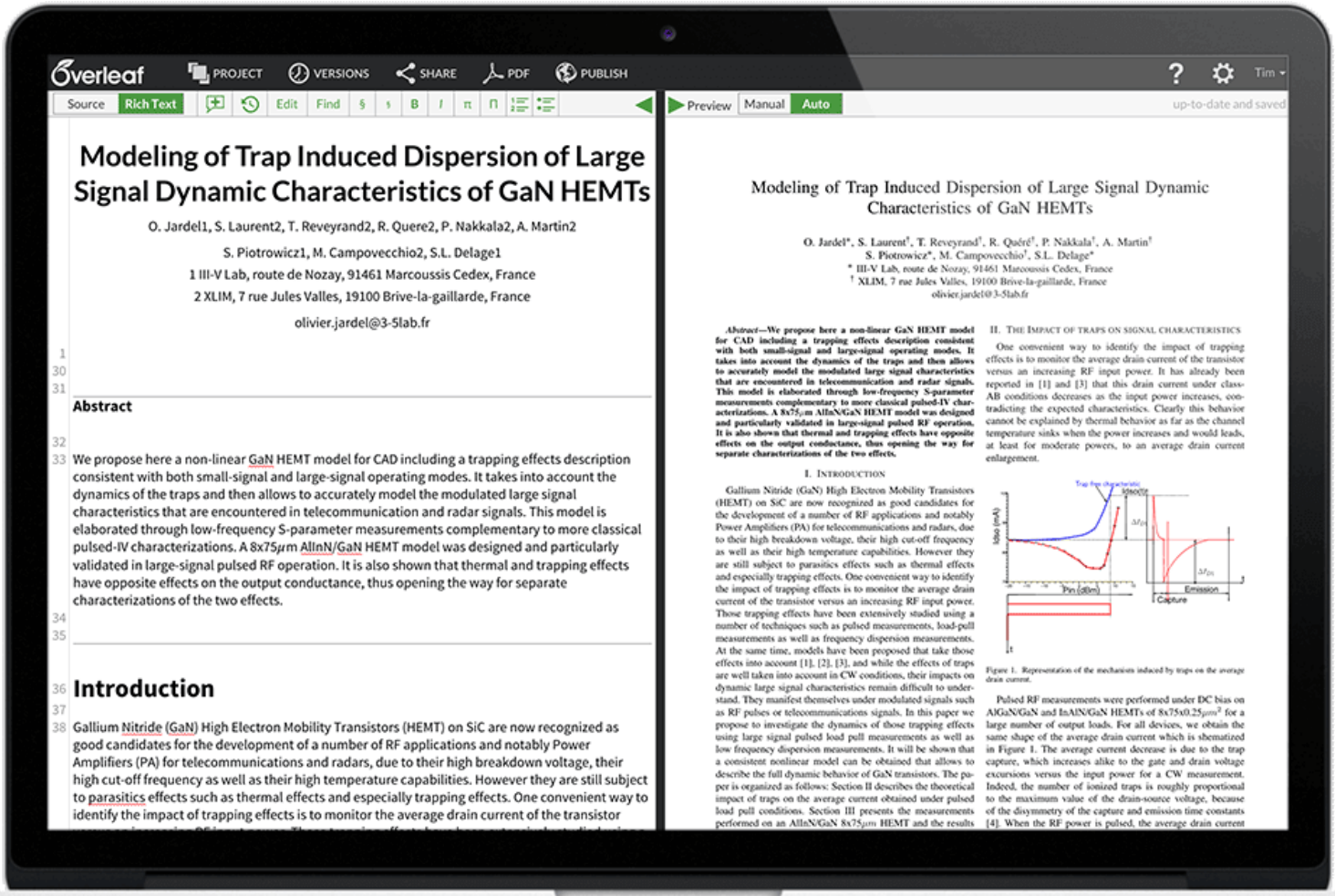


Edit on the left, preview on the right



Edit the underlying LaTeX code directly

Overleaf | PROJECT | VERSIONS | SHARE | PDF | PUBLISH | John Lees-Miller

Add files... | files | Compare_S.pdf | Compare_pulse.pdf | Courant_2.pdf | FigureLP_ancien_mod.pdf | biblio_traps_dynamics.bib | main.tex

Download as ZIP | Save to Dropbox

Source | Rich Text | Edit | Find | More

```
\documentclass[conference]{IEEEtran}

\usepackage[utf8x]{inputenc}
\usepackage[english]{babel}
\usepackage[cmex10]{amsmath}

\usepackage{mathabx}
\usepackage{graphicx}
\usepackage{algorithmic}
\usepackage{array}
\usepackage{mdwmath}
\usepackage{mdwtab}
\usepackage{eqparbox}
\usepackage{todonotes}
\usepackage{url}

\hyphenation{op-tical net-works semi-conduc-tor}

\begin{document}

\title{\LARGE Modeling of Trap Induced Dispersion of Large Signal
Dynamic Characteristics of GaN HEMTs}

\author{\authorblockN{%
O. Jardel\authorrefmark{1},
S. Laurent\authorrefmark{2},
T. Reveyrand\authorrefmark{2},
R. Qu\'{e}r\'{e}\authorrefmark{2},
P. Nakkala\authorrefmark{2},
A. Martin\authorrefmark{2}
\\ S. Piotrowicz\authorrefmark{1},
M. Campovecchio\authorrefmark{2},
S.L. Delage\authorrefmark{1}}
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III-V Lab, route de Nozay, 91461 Marcoussis Cedex, France}
\authorblockA{\authorrefmark{2}%
XLIM, 7 rue Jules Valles, 19100 Brive-la-gaillarde, France
\\olivier.jardel@3-5lab.fr}}

\maketitle

\begin{abstract}
We propose here a non-linear GaN HEMT model for CAD including a
trapping effects description consistent with both small-signal
and large-signal operating modes. It takes into account the
dynamics of the traps and then allows to accurately model the
modulated large signal characteristics that are encountered in
telecommunication and radar signals. This model is elaborated
```
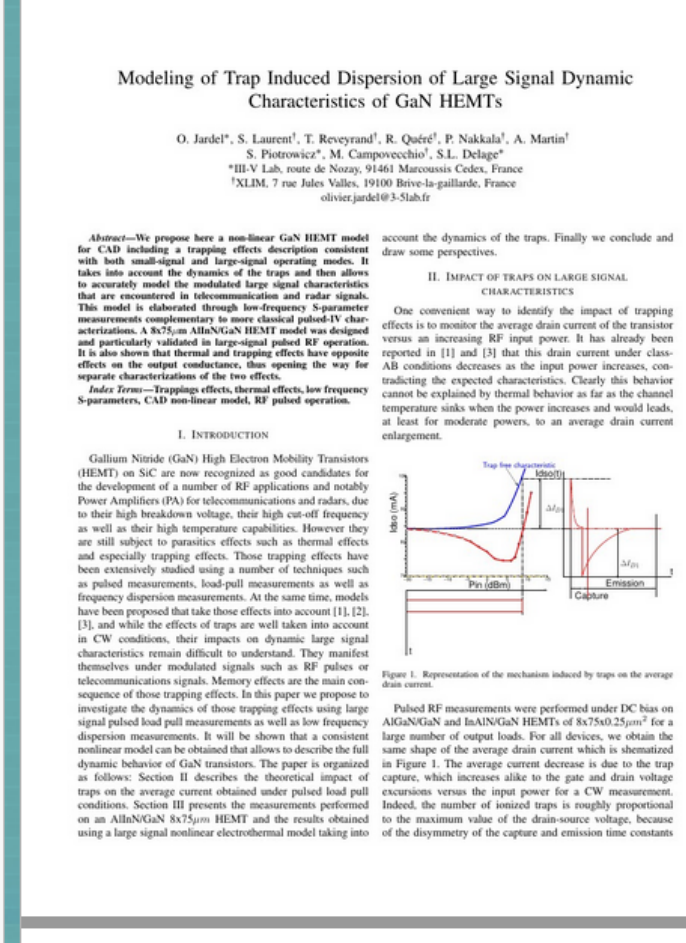

Preview | Manual | Auto | up-to-date and saved



Modeling of Trap Induced Dispersion of Large Signal Dynamic Characteristics of GaN HEMTs

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S. Piotrowicz*, M. Campovecchio†, S.L. Delage*
*III-V Lab, route de Nozay, 91461 Marcoussis Cedex, France
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olivier.jardel@3-5lab.fr

***Abstract*—We propose here a non-linear GaN HEMT model for CAD including a trapping effects description consistent with both small-signal and large-signal operating modes. It takes into account the dynamics of the traps and then allows to accurately model the modulated large signal characteristics that are encountered in telecommunication and radar signals. This model is elaborated through low-frequency S-parameter measurements complementary to more classical pulsed-IV characterizations. A 8x75$_{\mu m}$ AlInN/GaN HEMT model was designed and particularly validated in large-signal pulsed RF operation. It is also shown that thermal and trapping effects have opposite effects on the output conductance, thus opening the way for separate characterizations of the two effects.**

***Index Terms*—Trappings effects, thermal effects, low frequency S-parameters, CAD non-linear model, RF pulsed operation.**

I. Introduction

Gallium Nitride (GaN) High Electron Mobility Transistors (HEMT) on SiC are now recognized as good candidates for the development of a number of RF applications and notably Power Amplifiers (PA) for telecommunications and radars, due to their high breakdown voltage, their high cut-off frequency as well as their high temperature capabilities. However they are still subject to parasitics effects such as thermal effects and especially trapping effects. Those trapping effects have been extensively studied using a number of techniques such as pulsed measurements, load-pull measurements as well as frequency dispersion measurements. At the same time, models have been proposed that take those effects into account [1], [2], [3], and while the effects of traps are well taken into account in CW conditions, their impacts on dynamic large signal characteristics remain difficult to understand. They manifest themselves under modulated signals such as RF pulses or telecommunications signals. Memory effects are the main consequence of those trapping effects. In this paper we propose to investigate the dynamics of those trapping effects using large signal pulsed load pull measurements as well as low frequency dispersion measurements. It will be shown that a consistent nonlinear model can be obtained that allows to describe the full dynamic behavior of GaN transistors. The paper is organized as follows: Section II describes the theoretical impact of traps on the average current obtained under pulsed load pull conditions. Section III presents the measurements performed on an AlInN/GaN 8x75μm HEMT and the results obtained using a large signal nonlinear electrothermal model taking into account the dynamics of the traps. Finally we conclude and draw some perspectives.

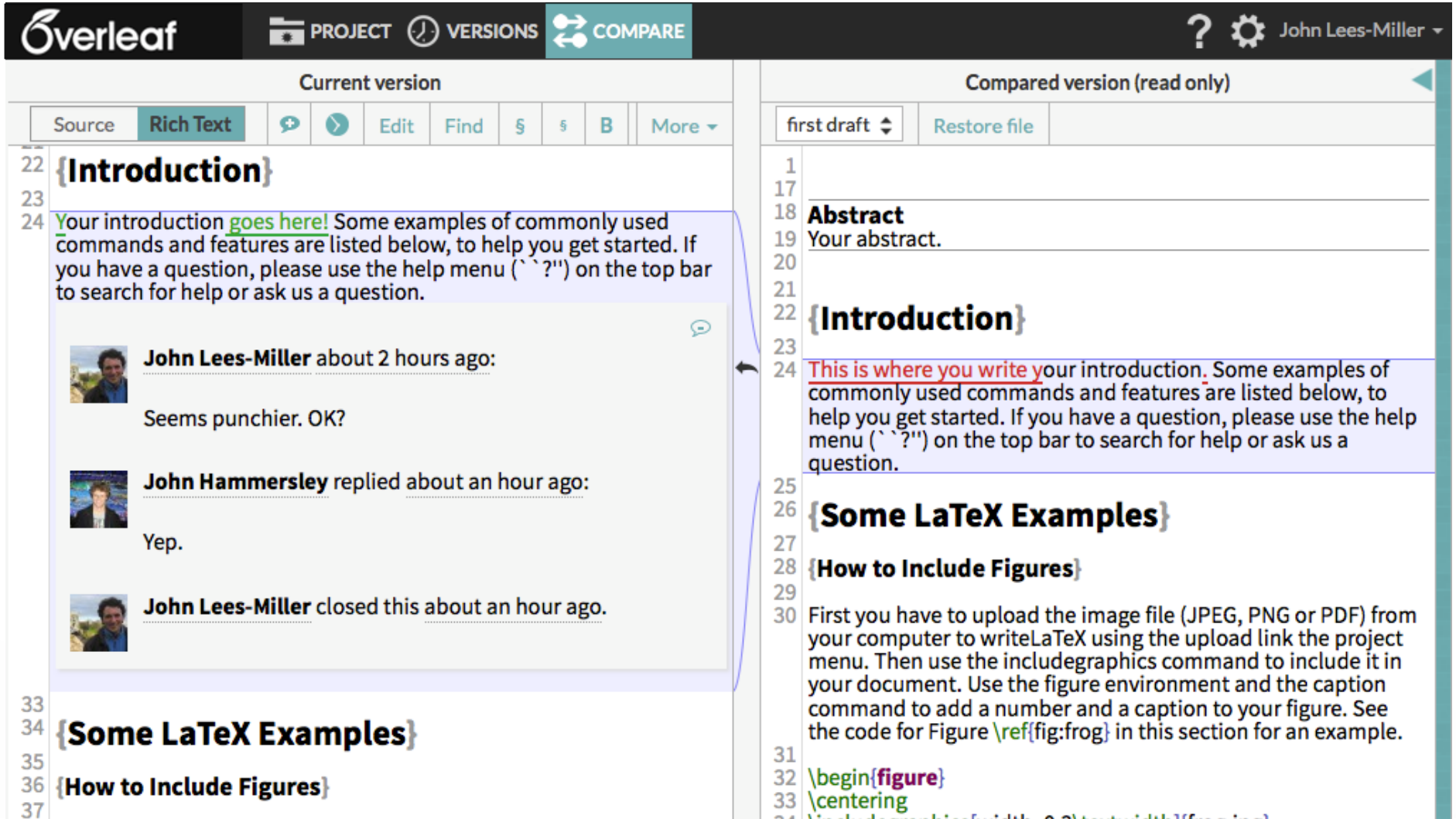
II. Impact of Traps on Large Signal Characteristics

One convenient way to identify the impact of trapping effects is to monitor the average drain current of the transistor versus an increasing RF input power. It has already been reported in [1] and [3] that this drain current under class-AB conditions decreases as the input power increases, contradicting the expected characteristics. Clearly this behavior cannot be explained by thermal behavior as far as the channel temperature sinks when the power increases and would leads, at least for moderate powers, to an average drain current enlargement.

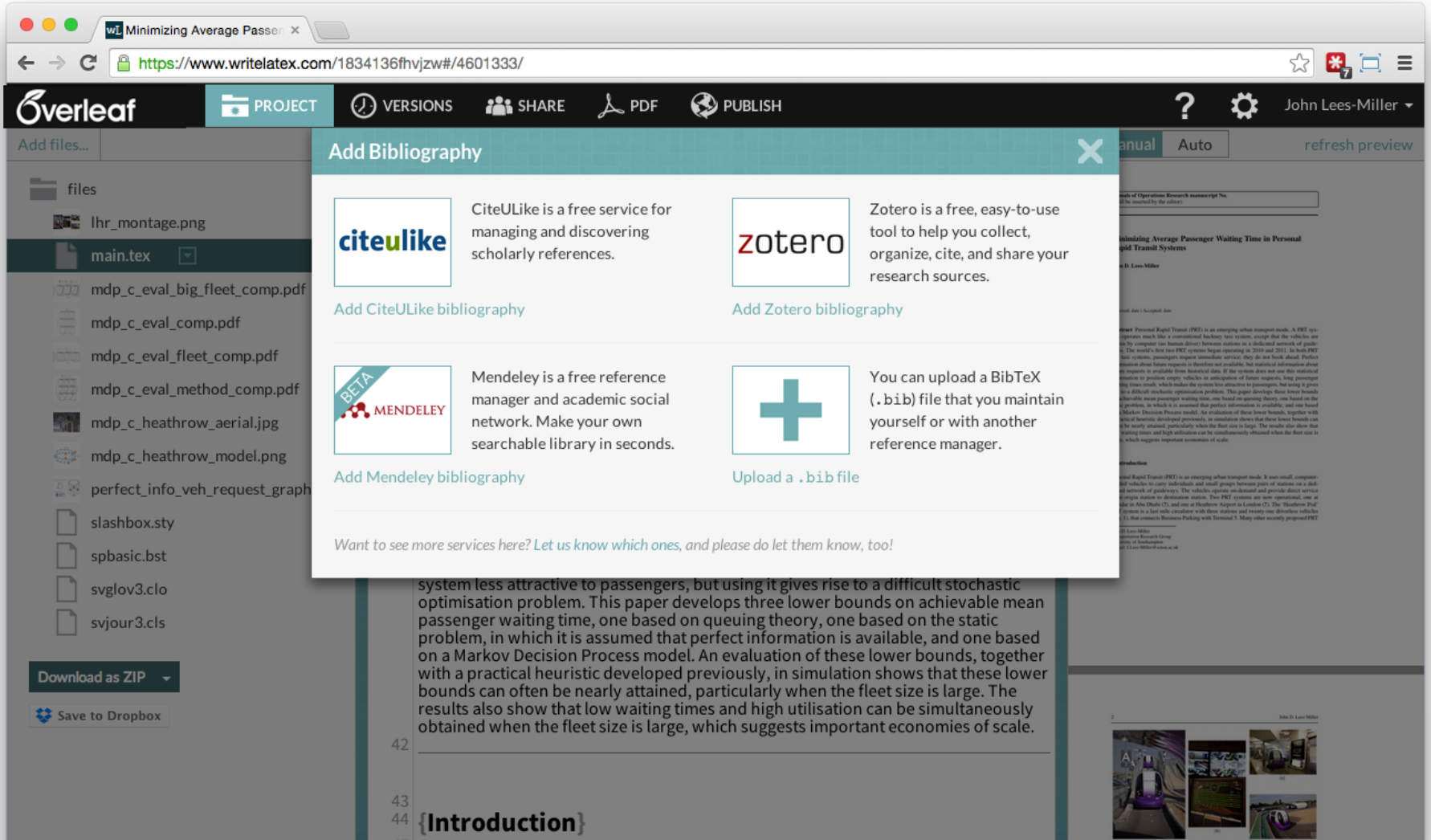
Figure 1. Representation of the mechanism induced by traps on the average drain current.

Pulsed RF measurements were performed under DC bias on AlGaN/GaN and InAlN/GaN HEMTs of 8x75x0.25μm^2 for a large number of output loads. For all devices, we obtain the same shape of the average drain current which is shematized in Figure 1. The average current decrease is due to the trap capture, which increases alike to the gate and drain voltage excursions versus the input power for a CW measurement. Indeed, the number of ionized traps is roughly proportional to the maximum value of the drain-source voltage, because of the disymmetry of the capture and emission time constants

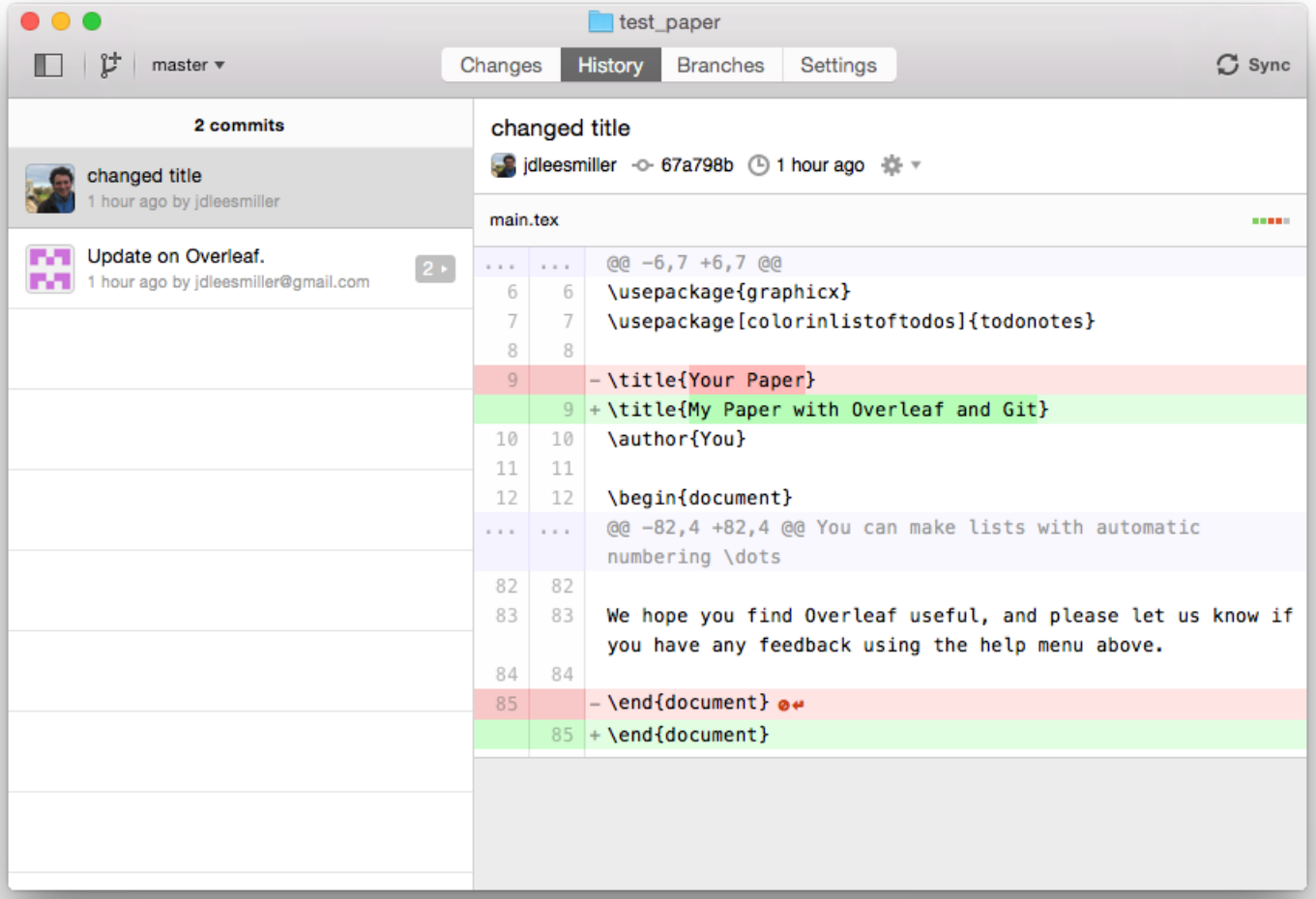
In-line comments & track changes for review



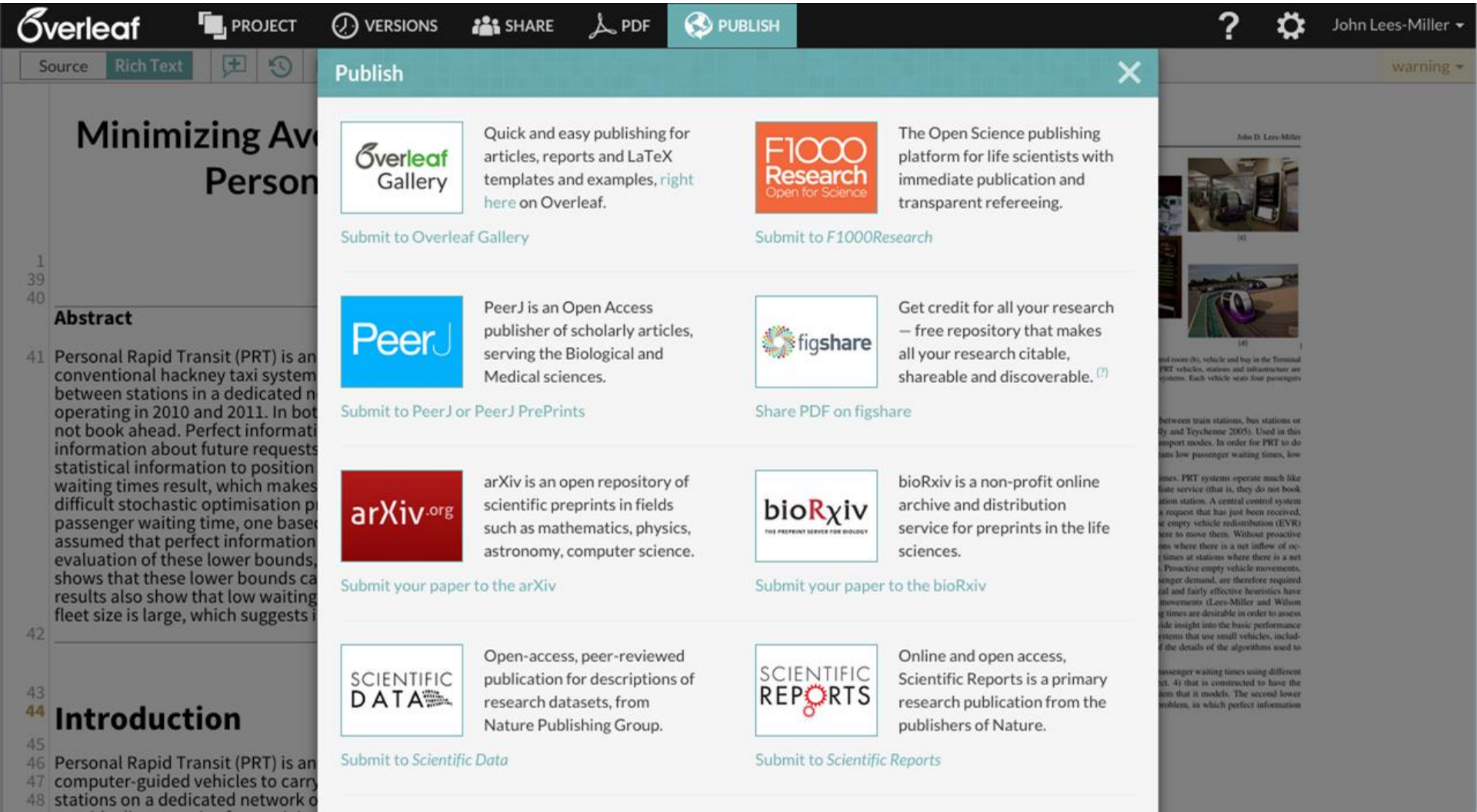
Connect your existing bibliography database



Work offline and sync changes with Git

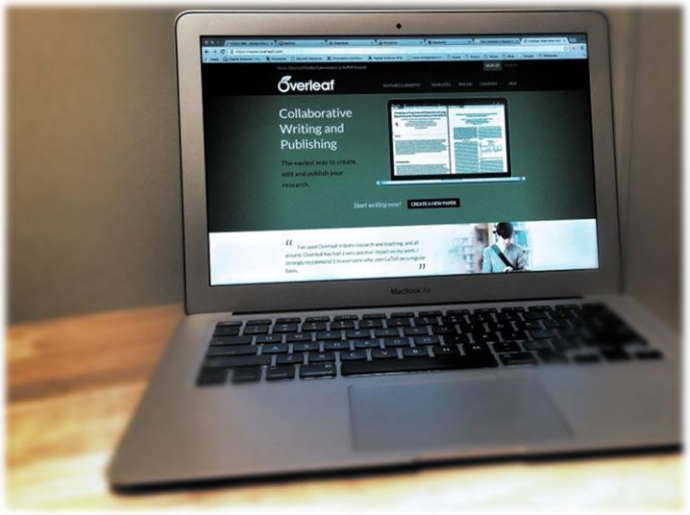


Publish your work directly to journals & repositories…



Summary

- One version of the document, accessible by all
- No need to email files – simply share the link
- Typesetting done automatically in the background while you type
- Automatic reference styles & citation links
- Review tools allow others real-time commenting directly on the document
- No software installation required



If you're new to LaTeX, try Part 1 of our online course: https://www.overleaf.com/latex/learn/free-online-introduction-to-latex-part-1

If you're familiar with LaTeX, try writing up part of a paper or project you're working on using a template from www.overleaf.com/latex/templates

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Getting more out of Overleaf

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Reference management

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Reference management

- Tools such as ReadCube, Zotero and Mendeley make it easy to keep a central database of references.

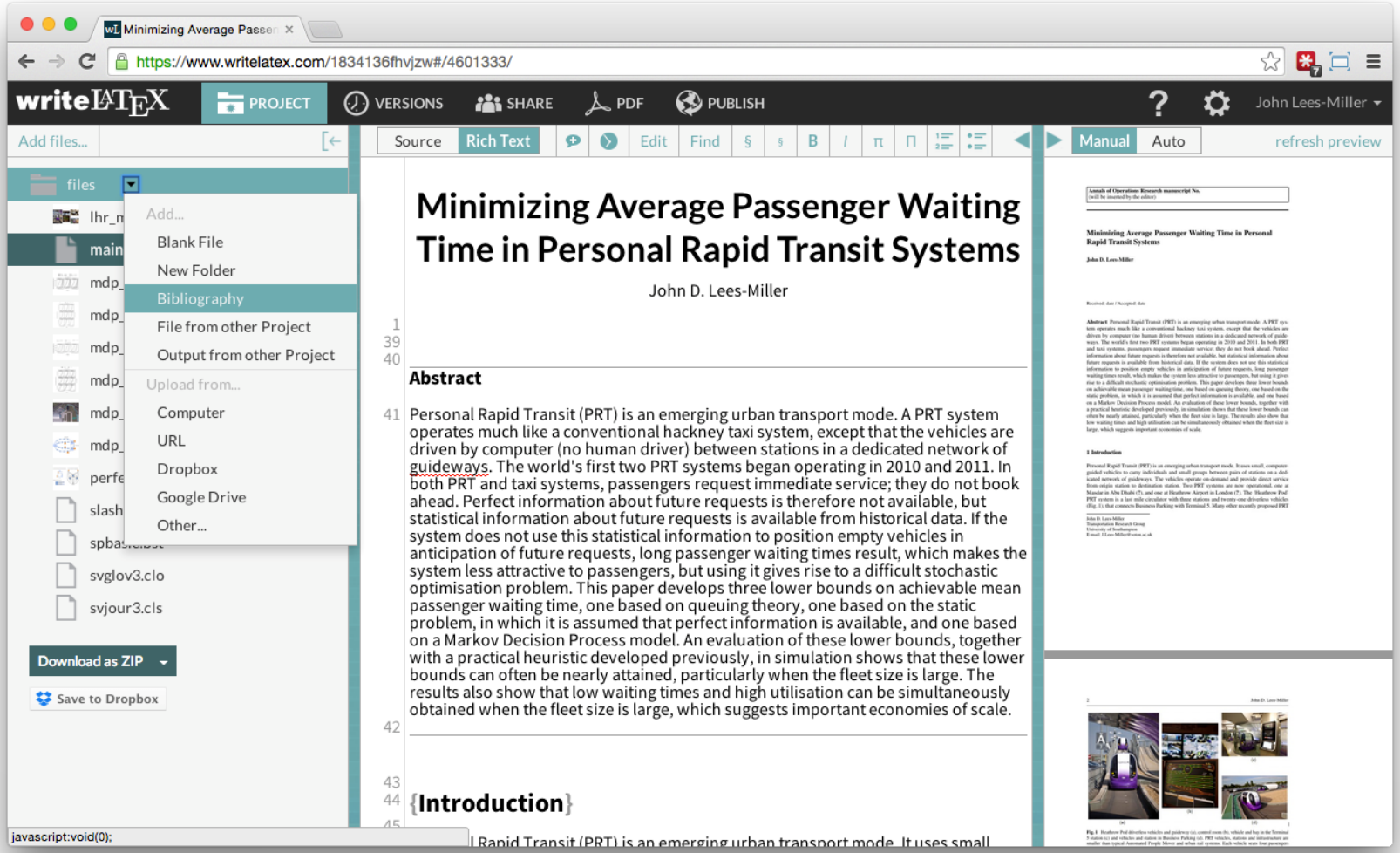
zotero

readcube

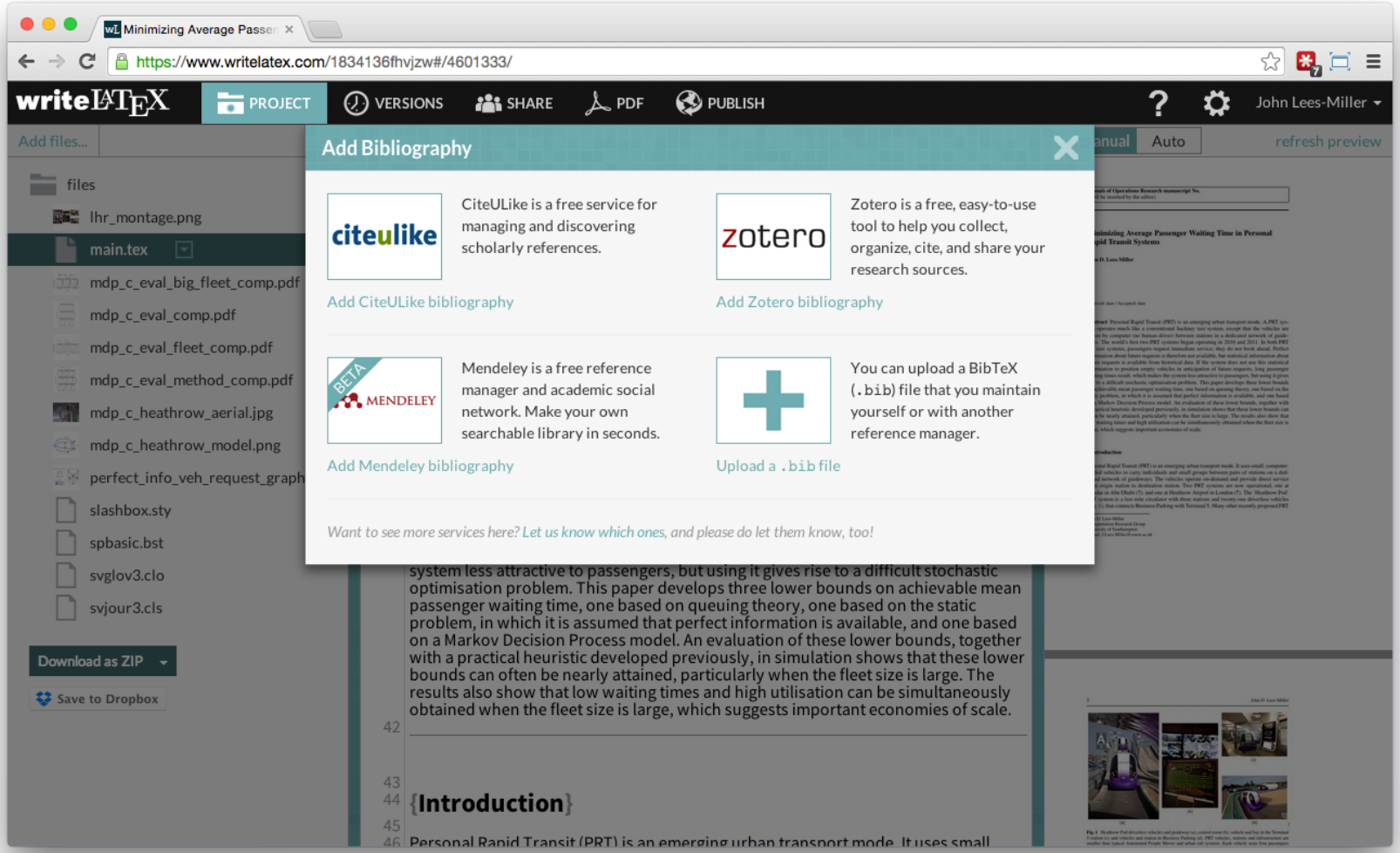
MENDELEY

Overleaf

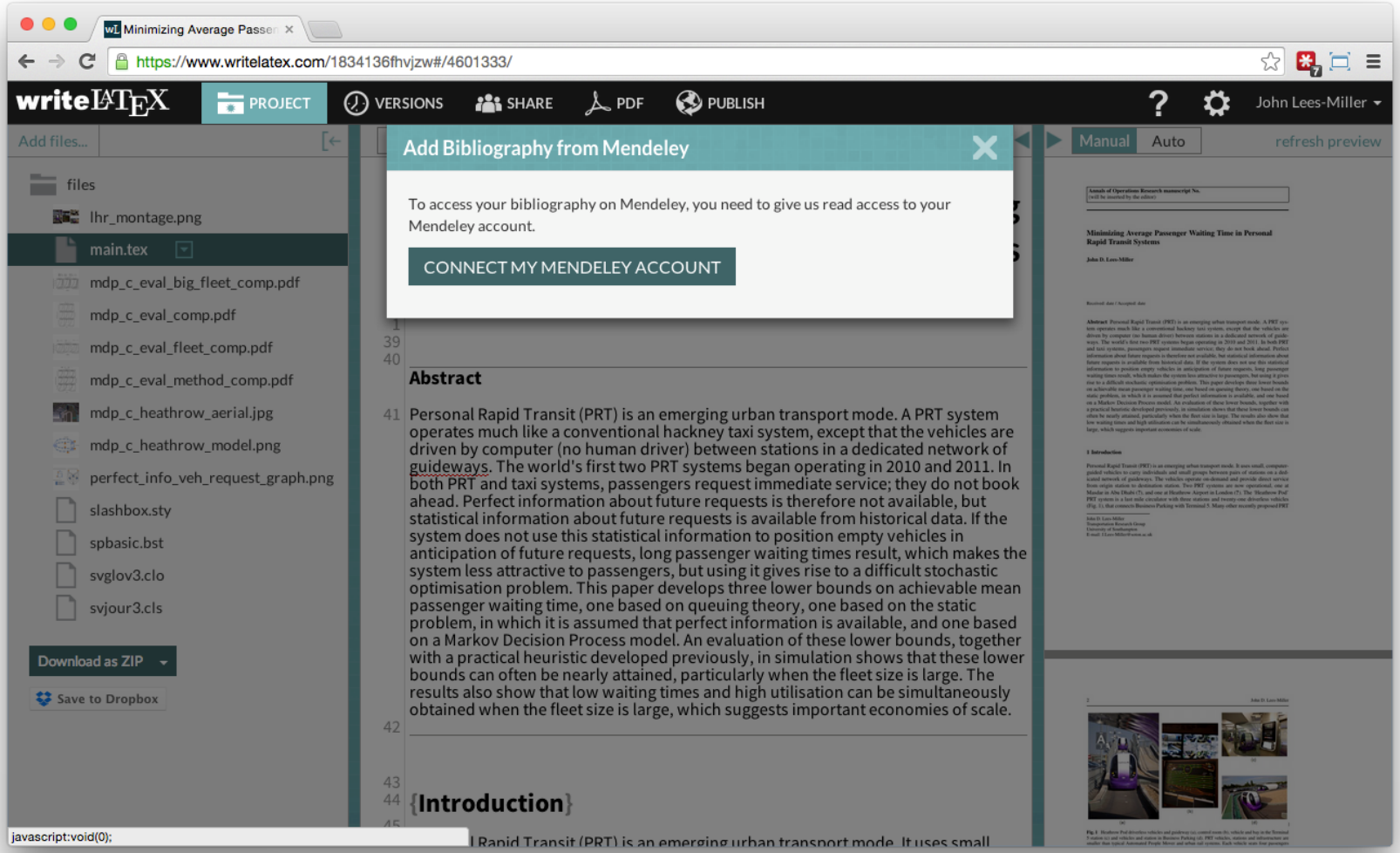
1. Click the ‘Add Bibliography’ option in the Project menu



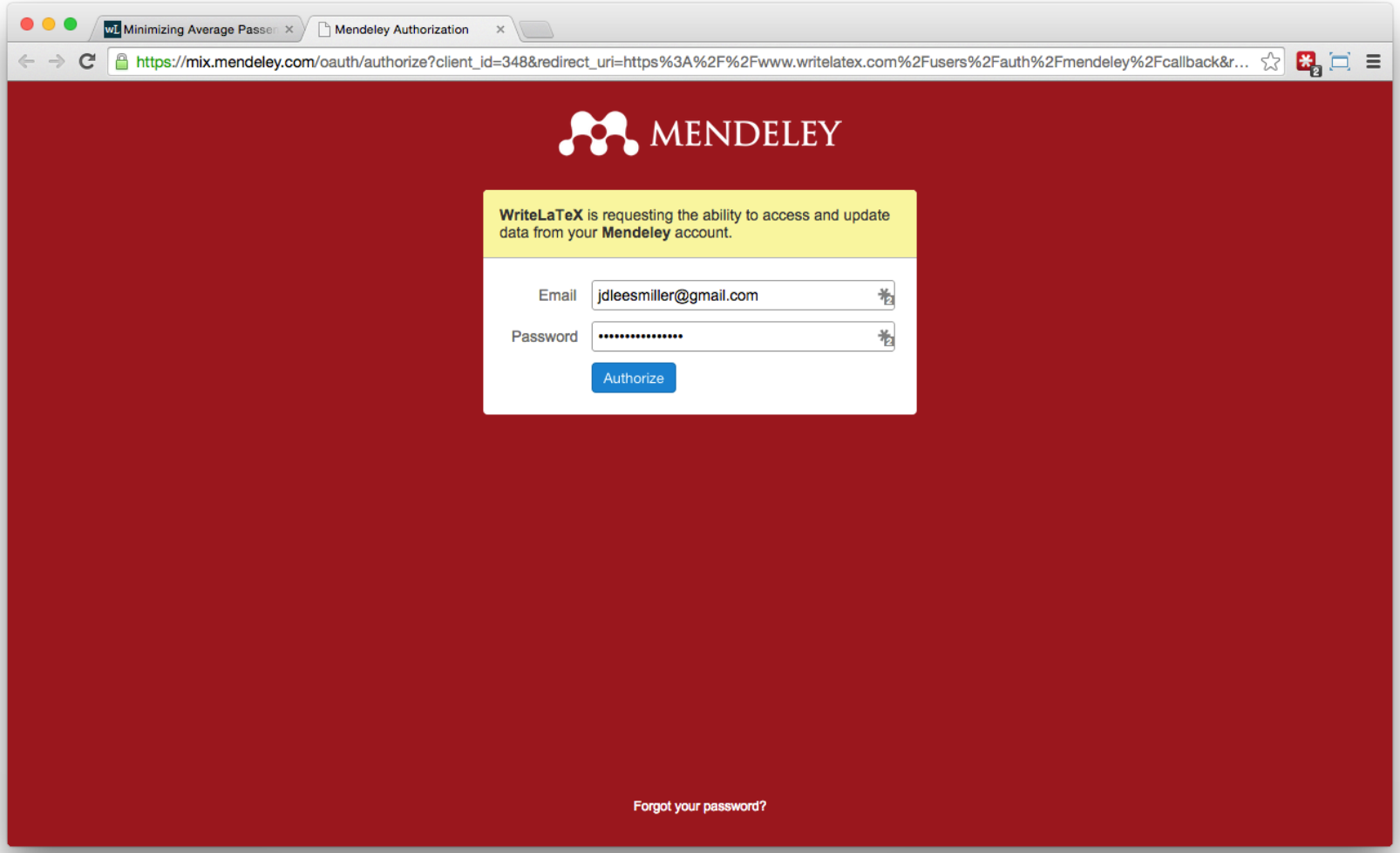
2. Choose where to import your bibliography from



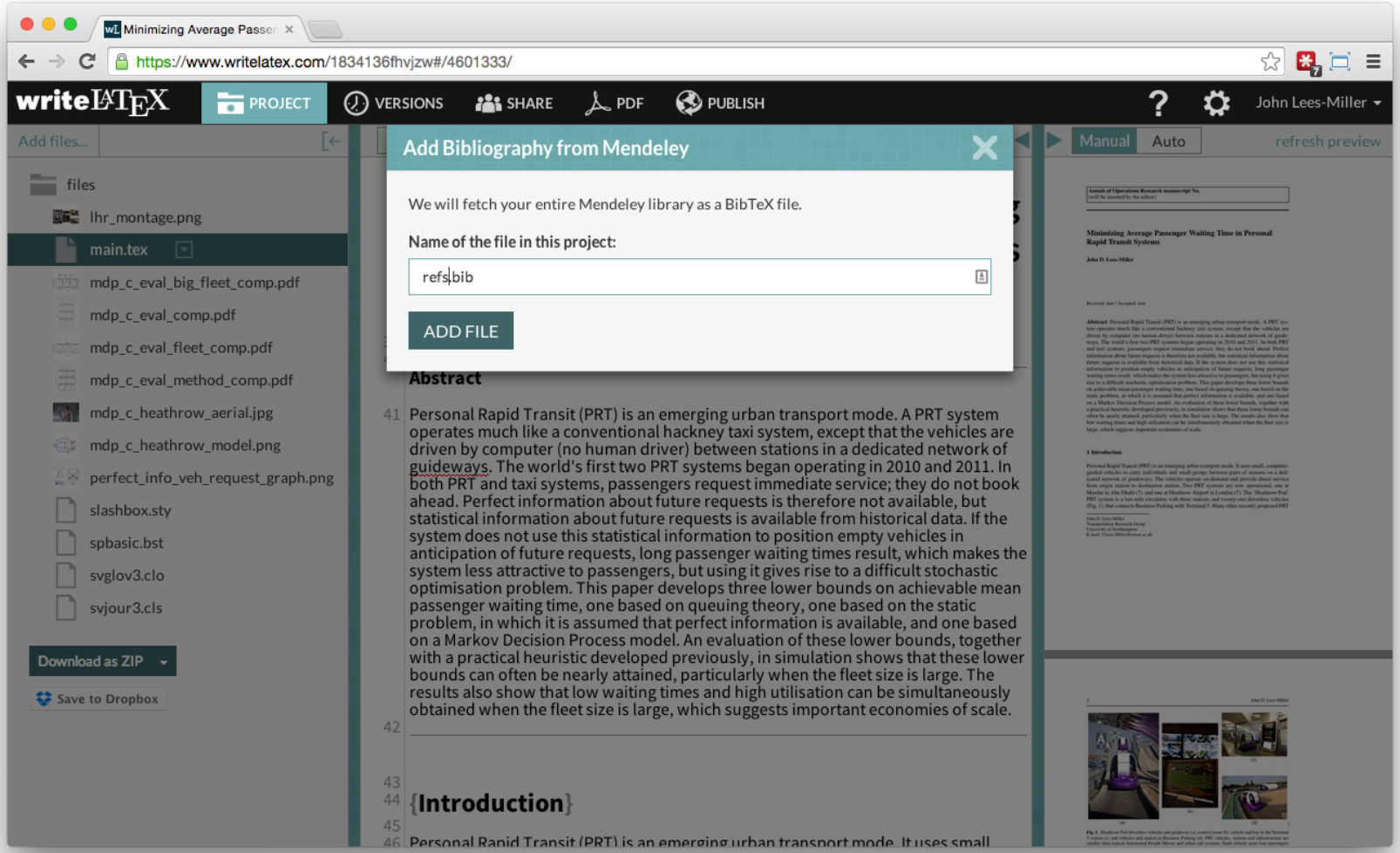
3. The first time you do this you'll need to connect your accounts



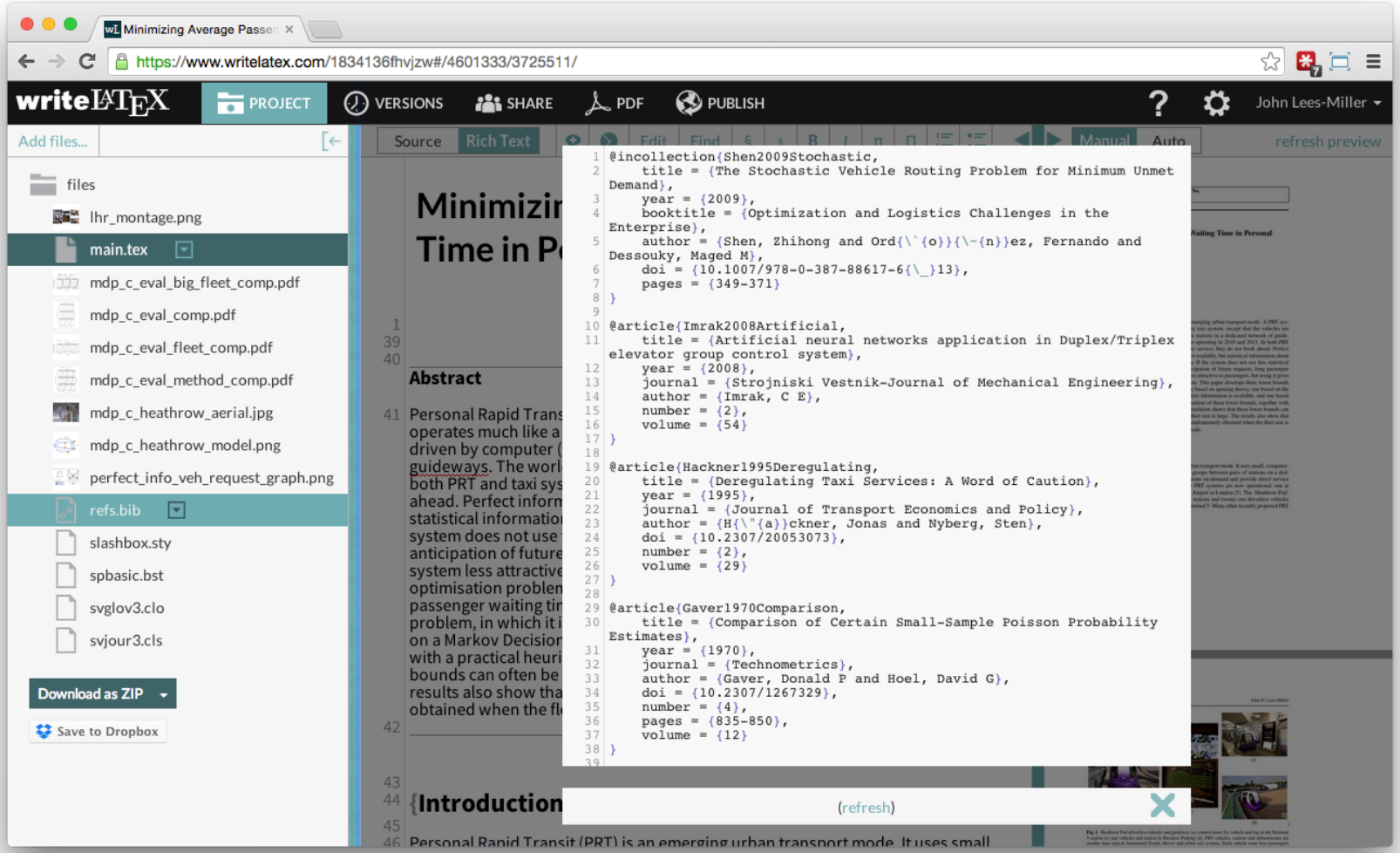
4. Authorize the connection if required



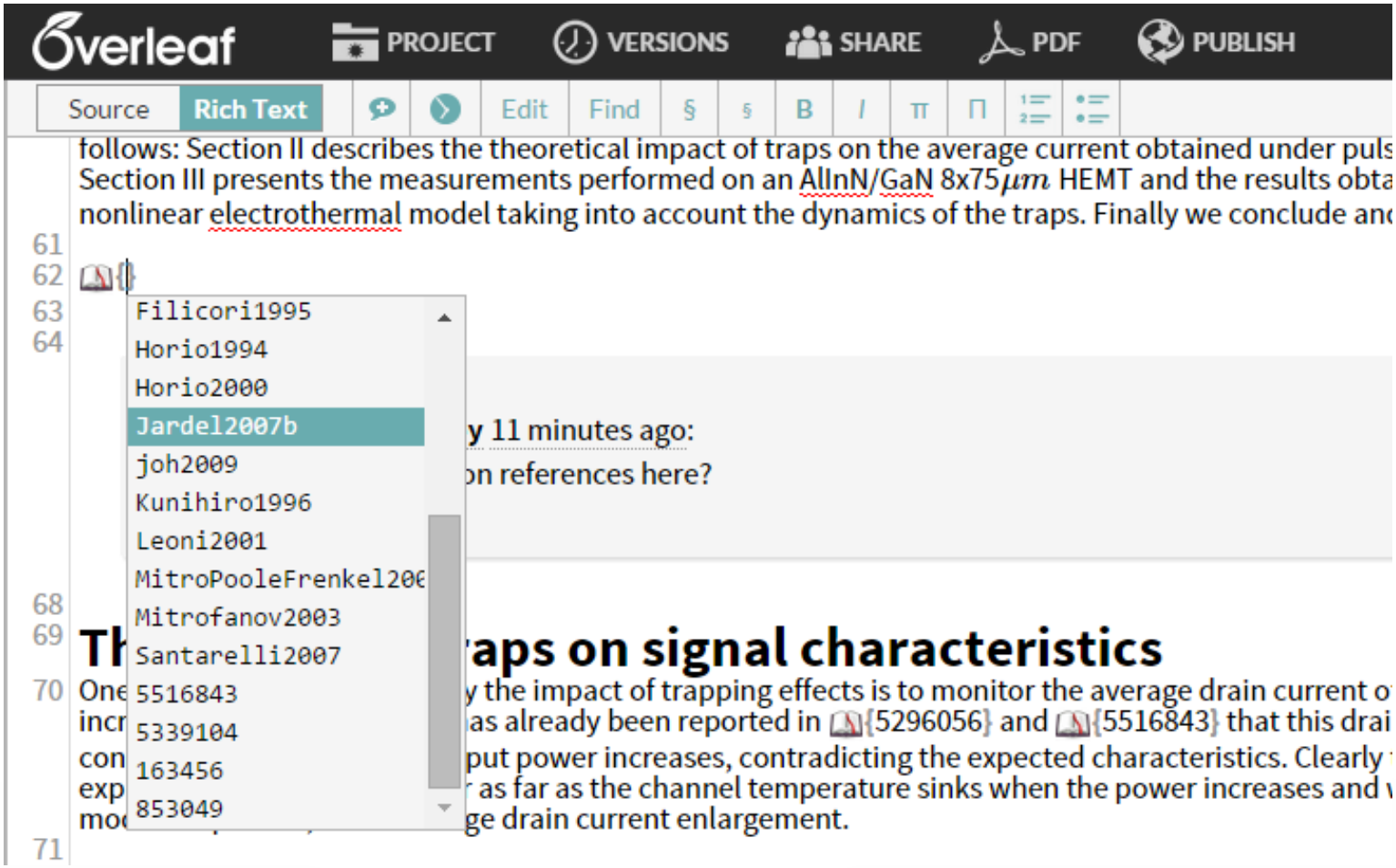
5. Choose a name for the .bib file in your project



6. The .bib file can be used as normal. Click refresh to sync.



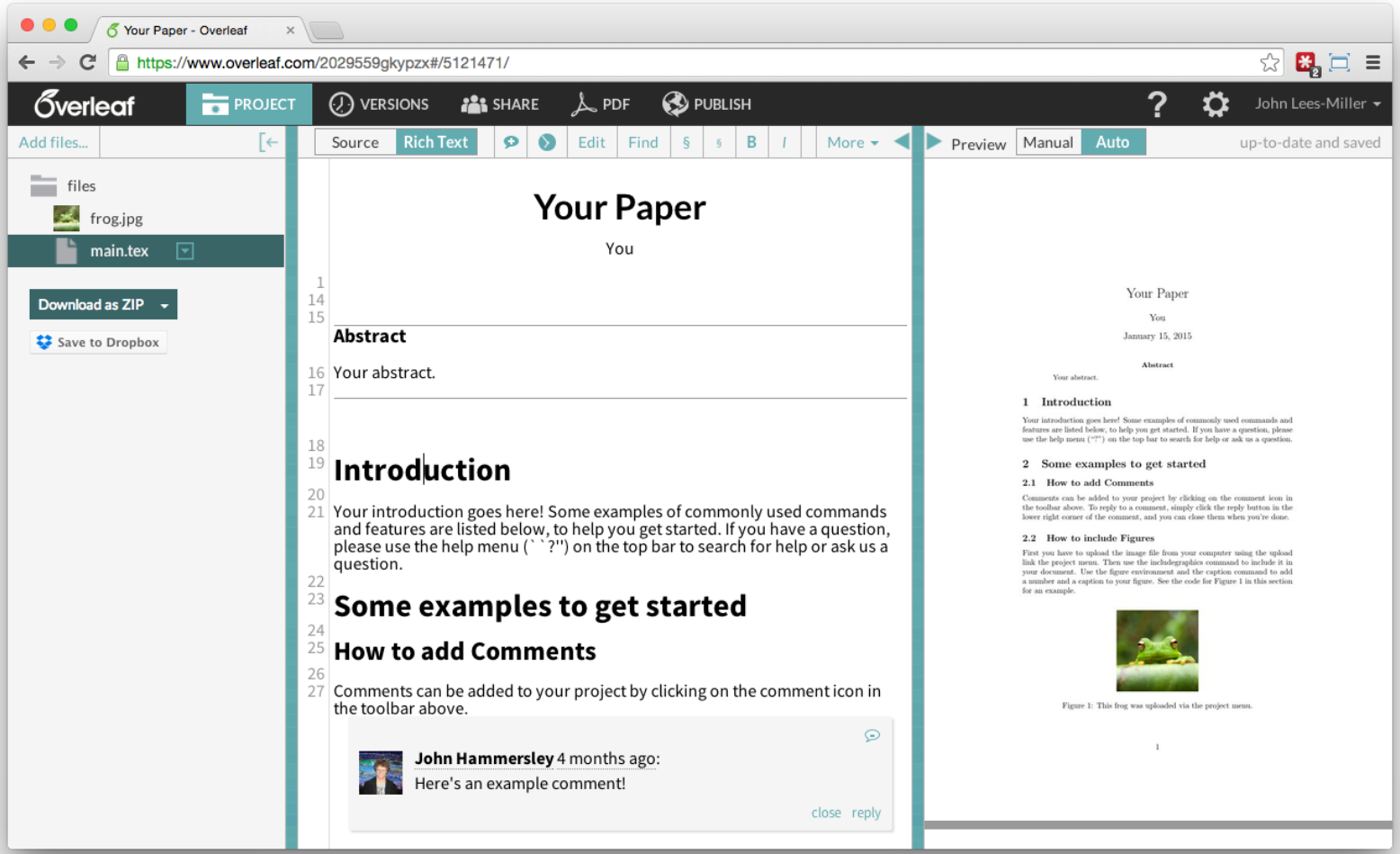
7. To cite a reference, use the \cite{} command



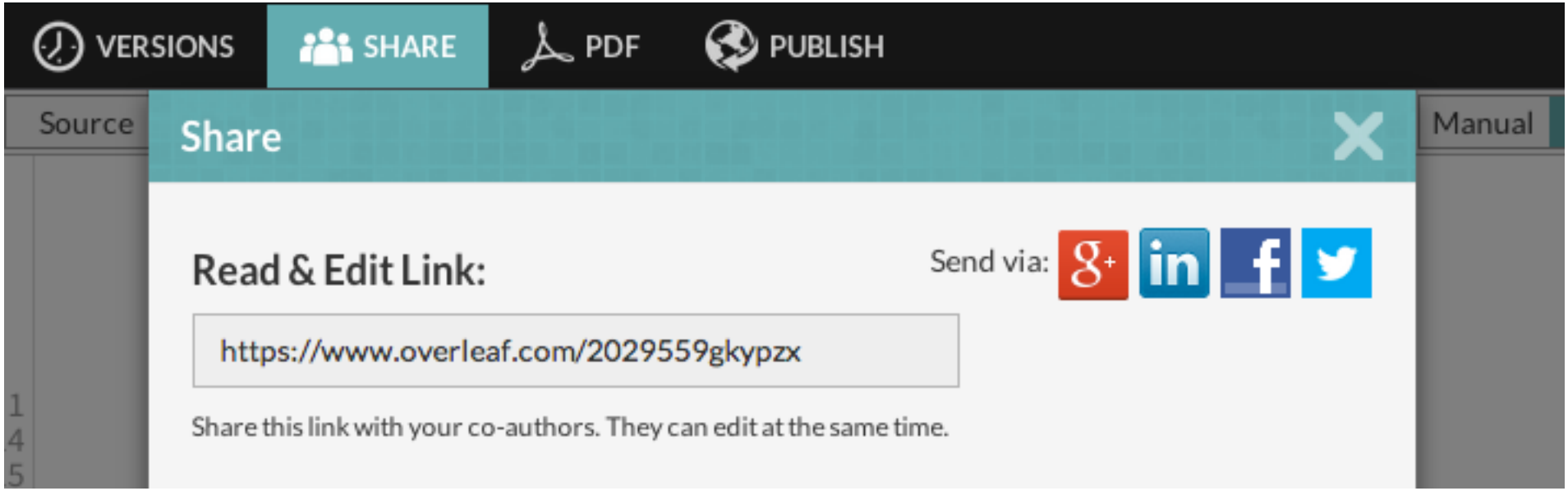
Offline sync with Git

Overleaf

1. Create (or open) a project on Overleaf

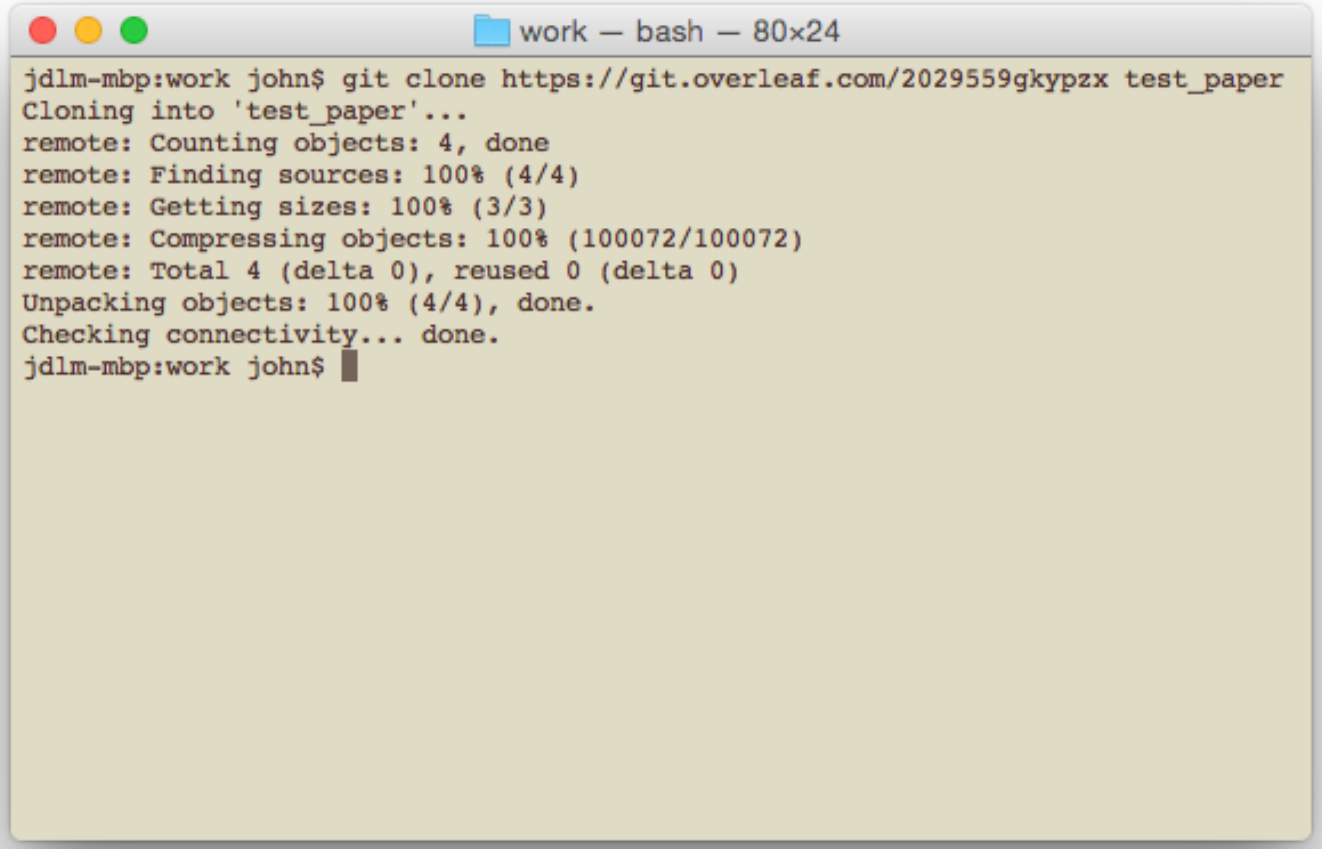


2. Find the Git link for your project

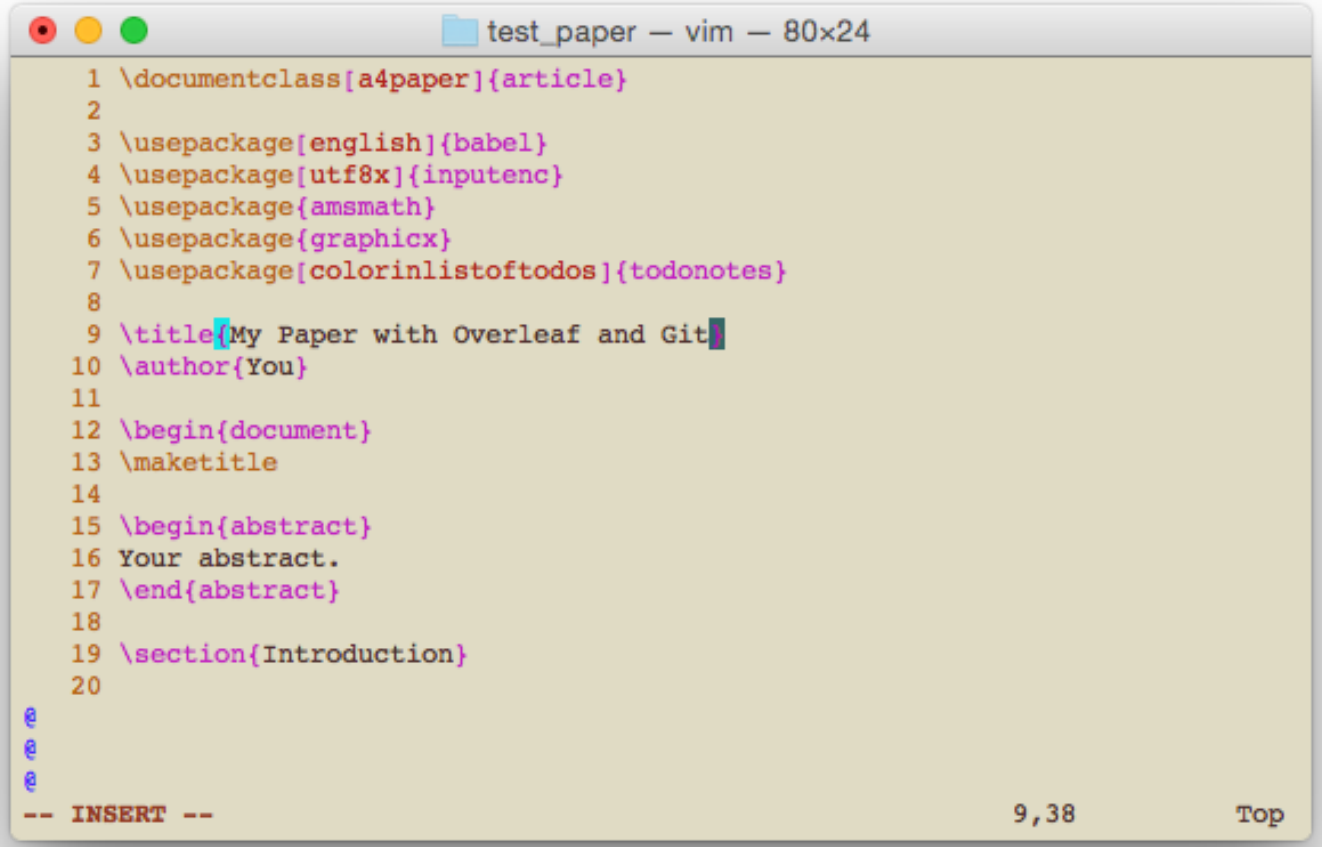


In this case, the project link is https://www.overleaf.com/2029559gkypzx, so its git link is https://git.overleaf.com/2029559gkypzx.

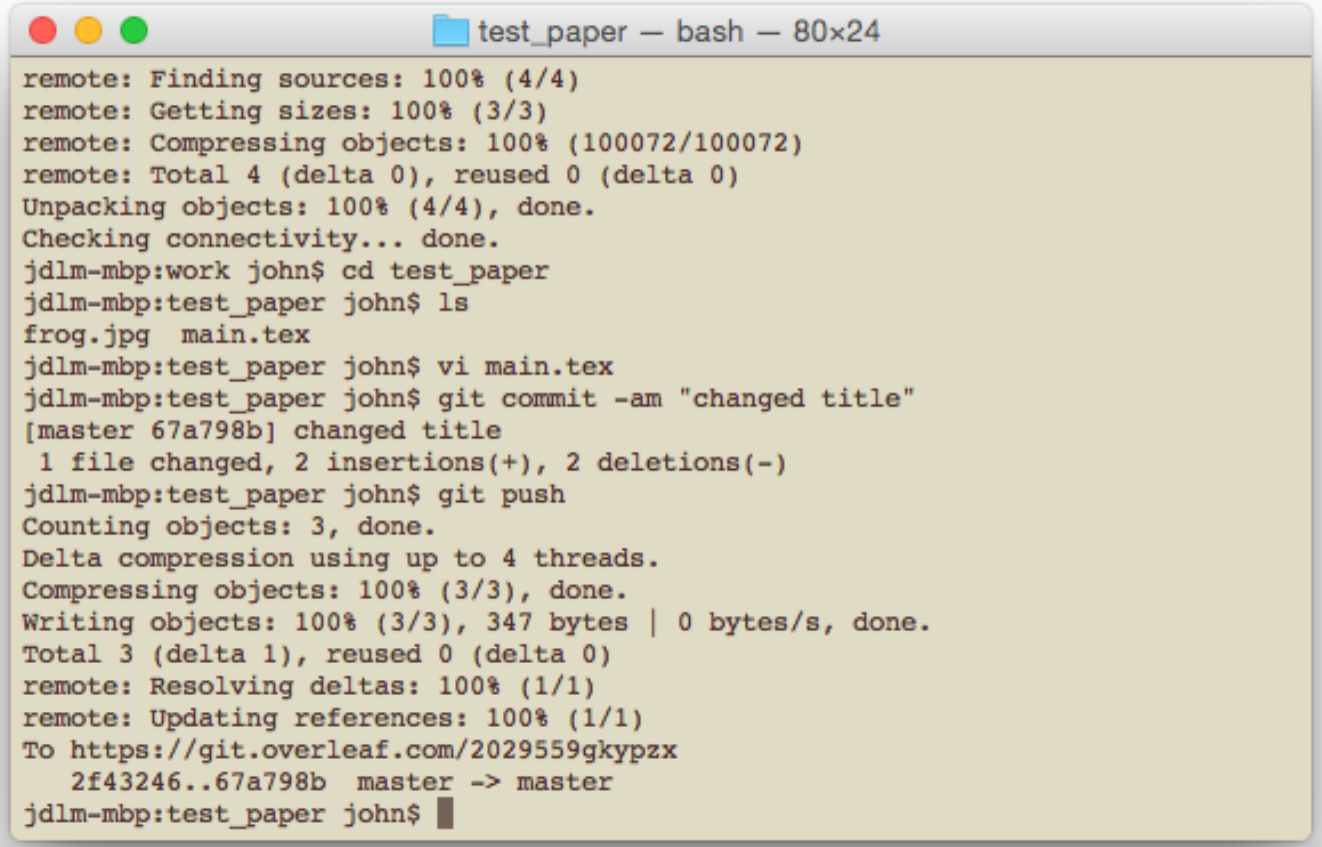
3. Clone your project with Git



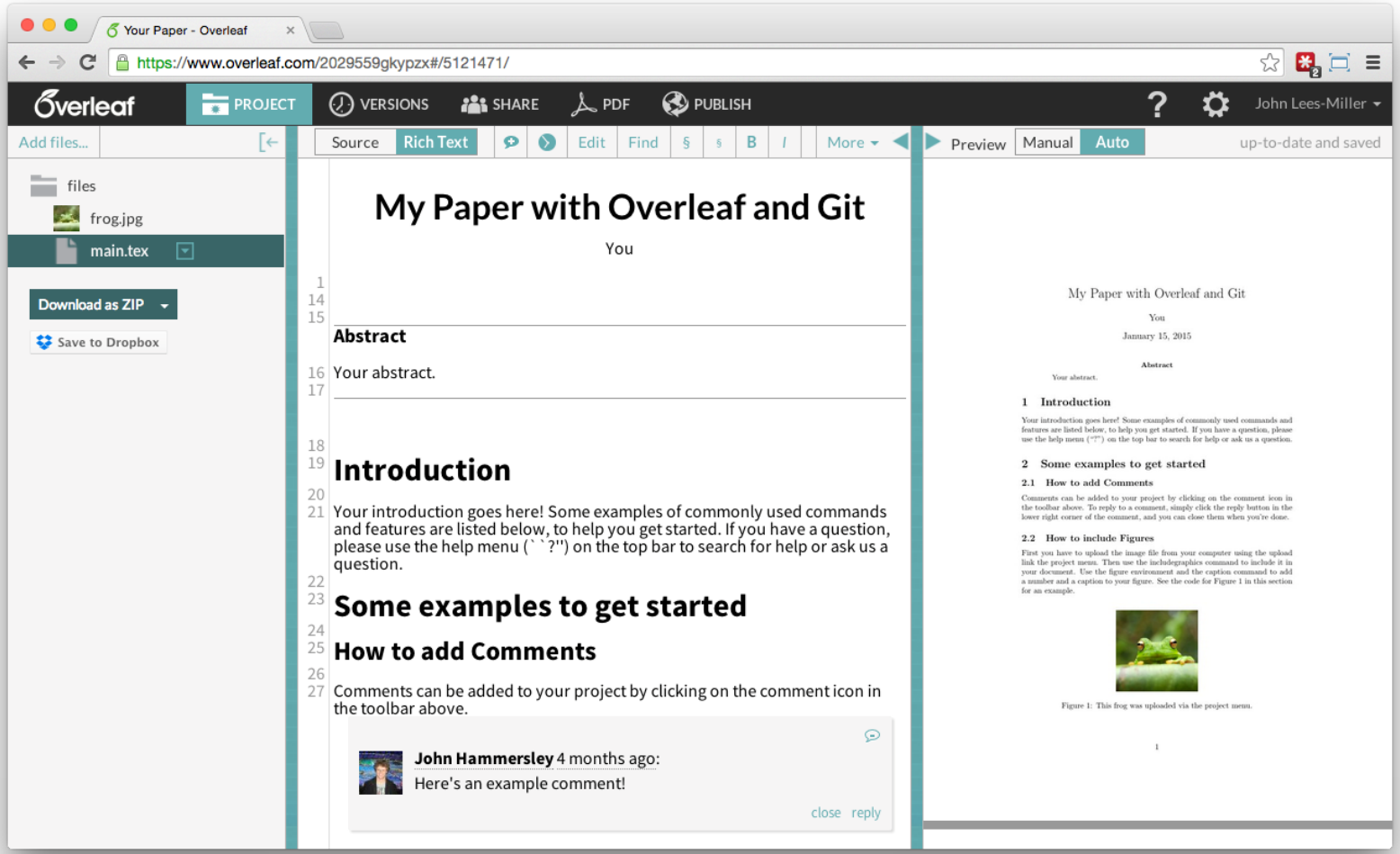
4. Edit your project and commit your changes



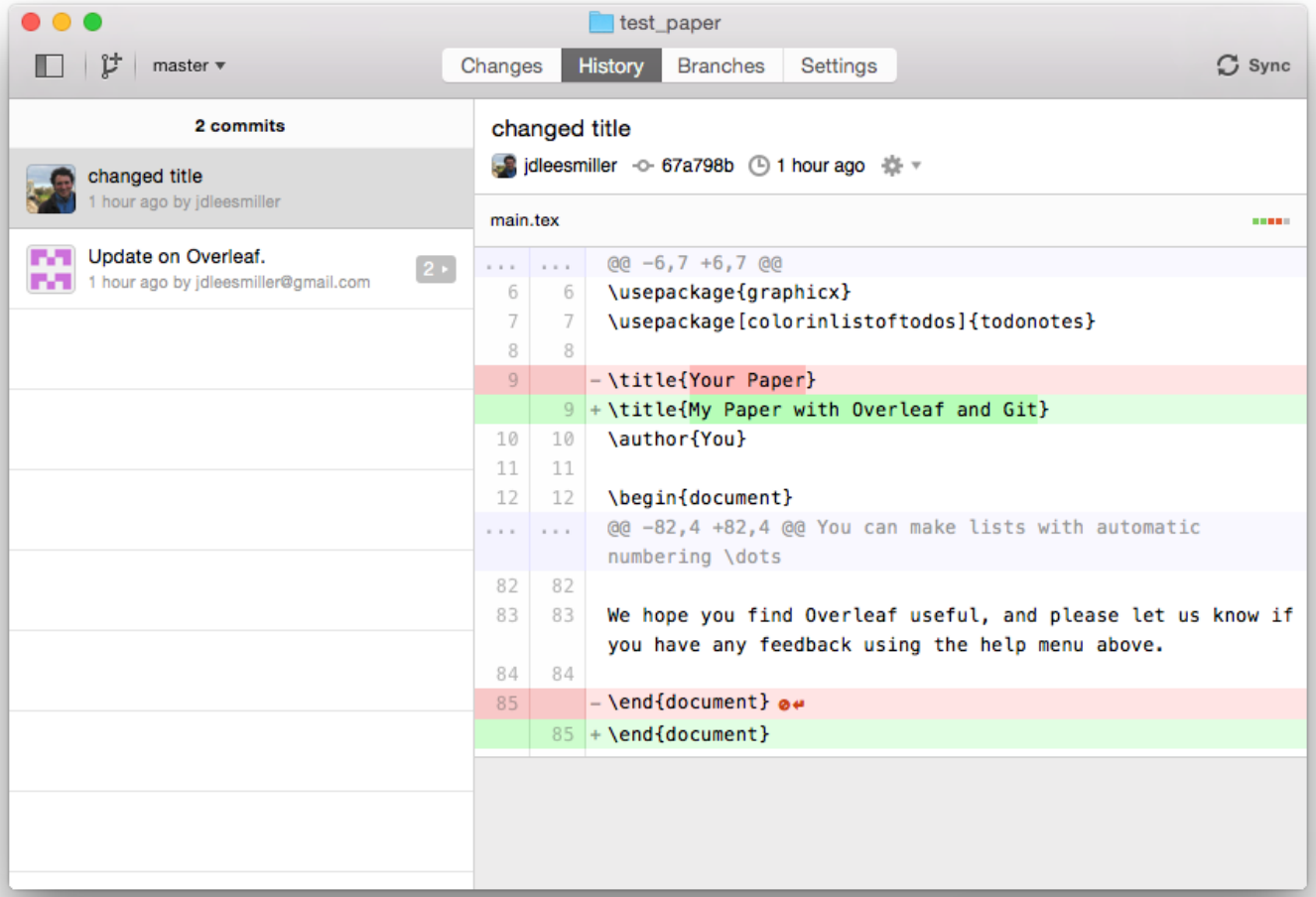
5. Push your changes to Overleaf



6. See the results online



Option: Use graphical Git clients



Adding, replying-to, and closing comments

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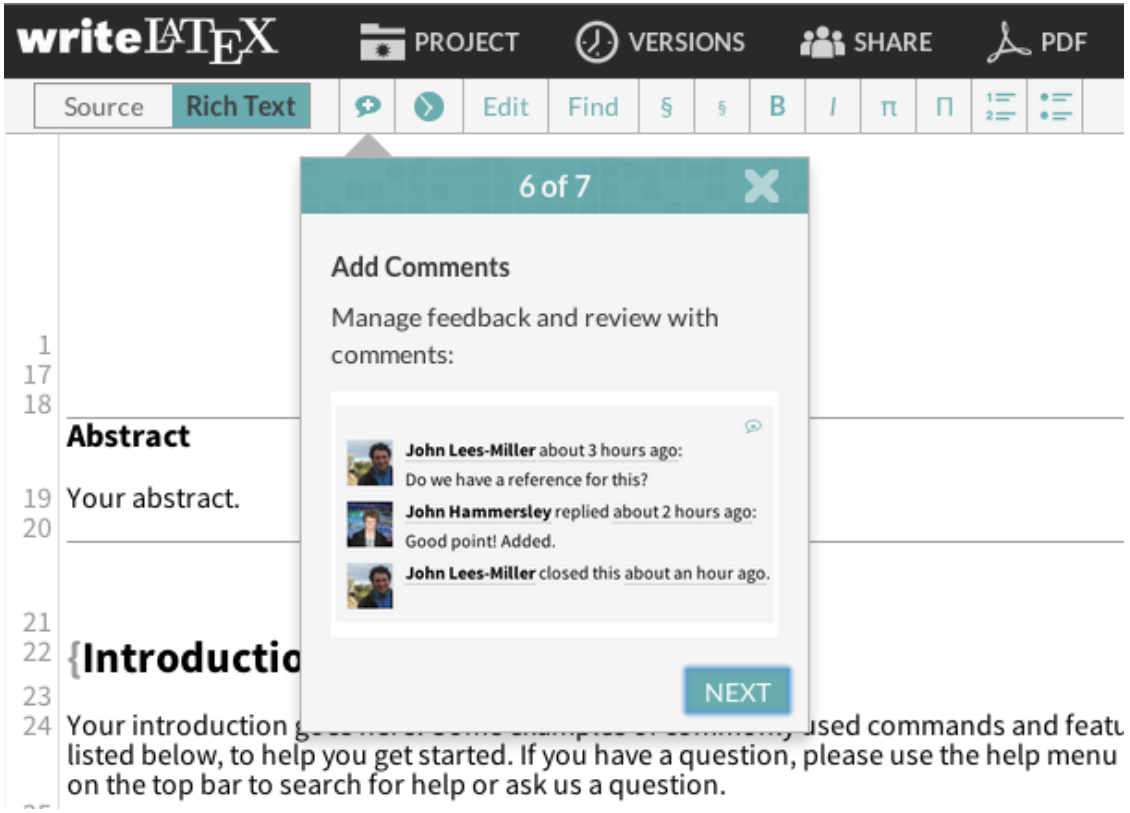
Adding comments and feedback

- It's often necessary to get feedback from colleagues
- Many online tools now offer integrated commenting



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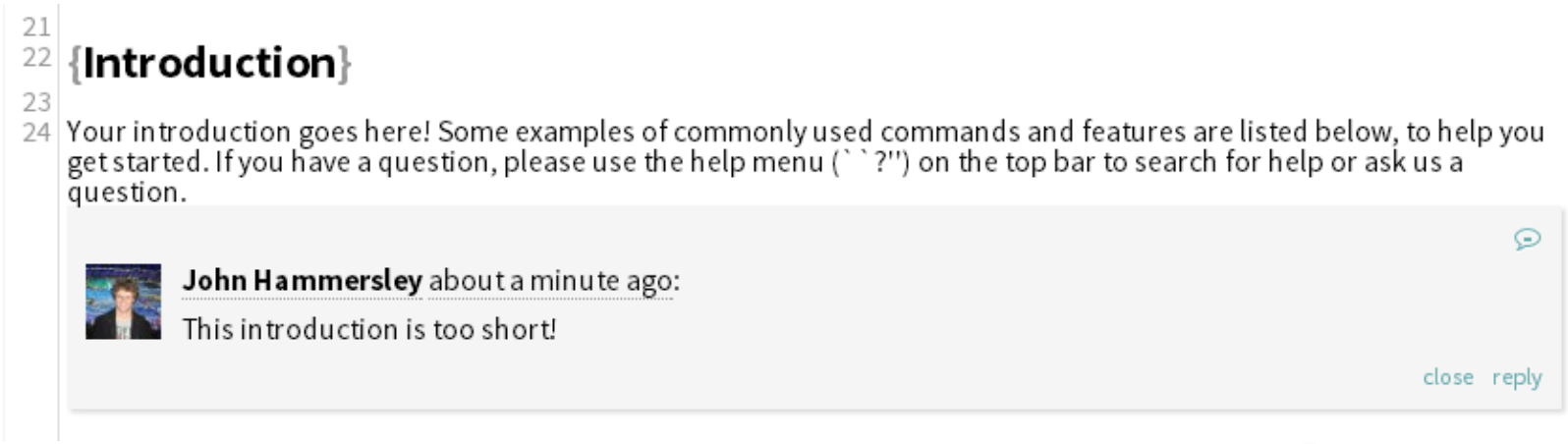
Adding comments and feedback

- Simply click the "Add comment" button on the editor toolbar, and type your comment in the box that appears.
- It'll then be inserted into the document:



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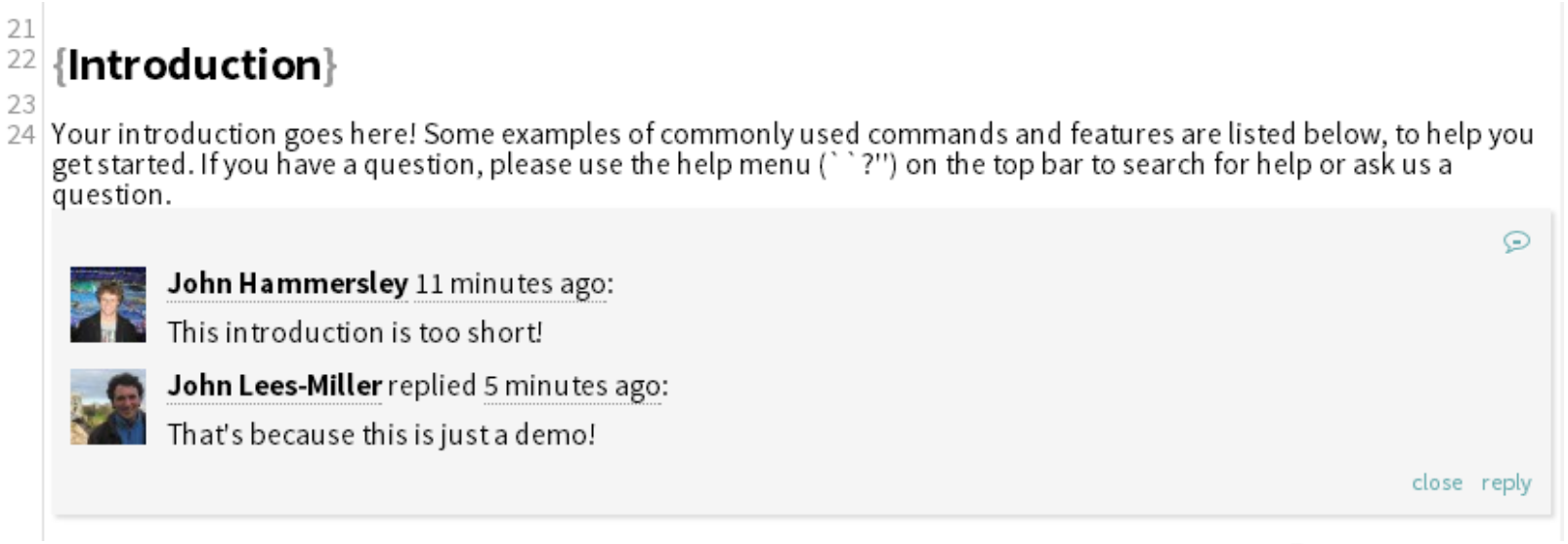
Adding comments and feedback

- You can reply to comments left by your collaborators by clicking on the "reply" option at the foot of their comment:



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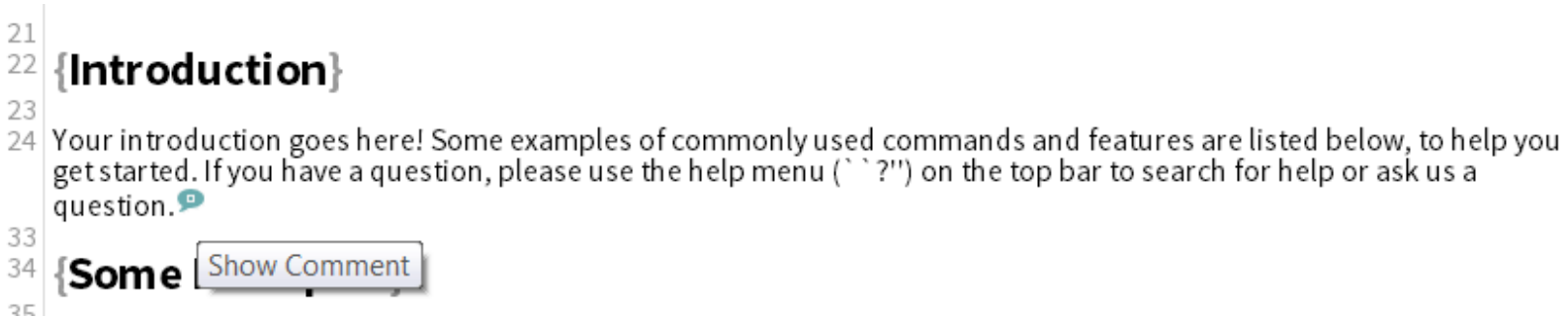
Adding comments and feedback

- It appears as a nested comment, and you can close the comments when you're done. To re-open any closed comments, simply click the comment icon in the document.



Overleaf

Other: Tables, Plots and Symbols

Table generator - http://www.tablesgenerator.com/

- An easy way to generate LaTeX tables:

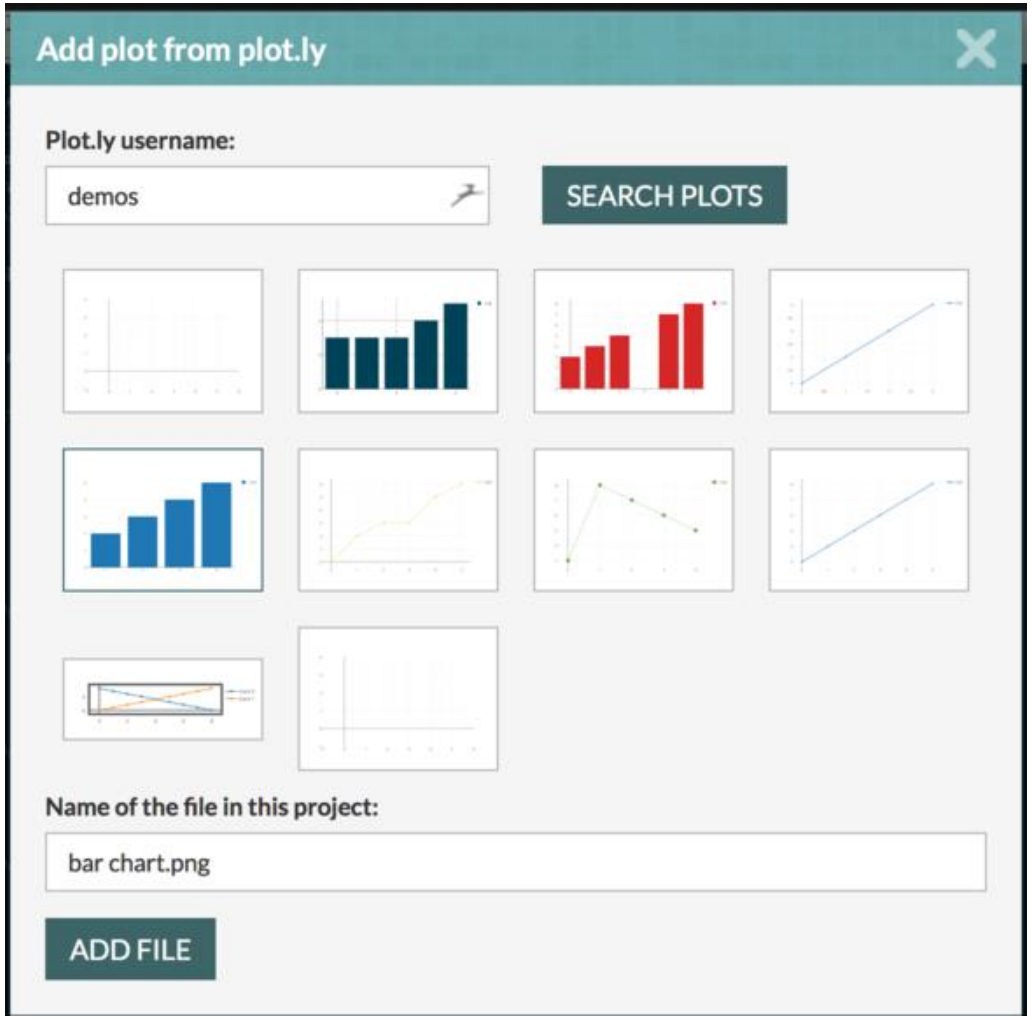
Name	Grade	Position
Alice	90	1
Bob	85	2
Charlie	74	3

Latex | Comma separated values | JSON | Markdown | HTML | BBCode | Balsamiq | Wiki markup | SQL | Mathematica | Plain text | No output | Output options

```
\begin{table}
    \begin{tabular}{lll}
    Name    & Grade & Position \\
    Alice   & 90    & 1        \\
    Bob     & 85    & 2        \\
    Charlie & 74    & 3        \\
    \end{tabular}
\end{table}
```

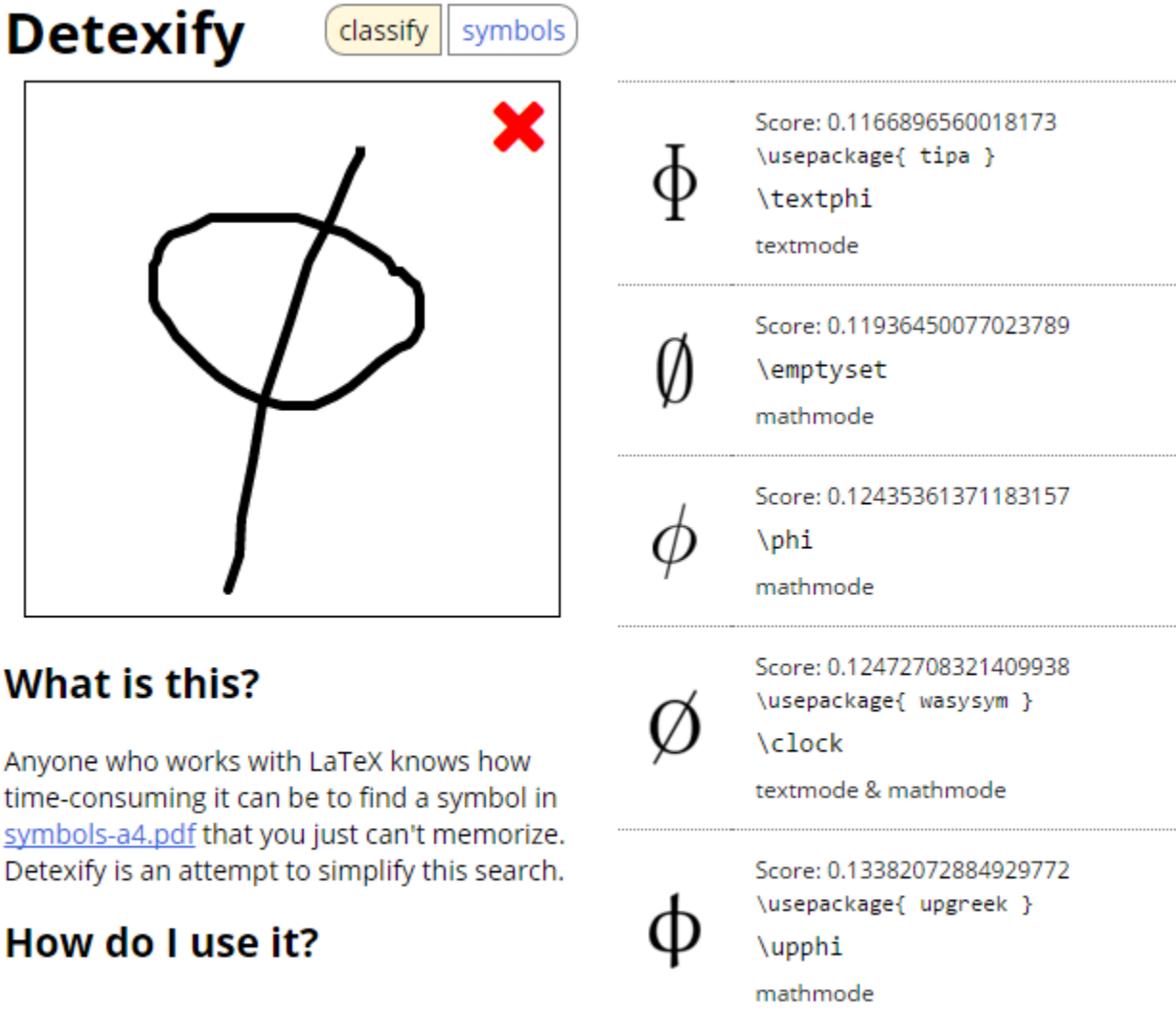
Adding Plots from plot.ly

- Import your plots from plot.ly directly into Overleaf
- Choose the ‘Add plot from plot.ly’ in the Project menu
- Enter your plot.ly username, and search your plots.



Find symbols:

- Just draw the symbol you'd like to use in your document
- Detexify finds it for you



Links to Additional Resources

- Free Introduction to LaTeX View
- Reference Management: Linking your Mendeley Account View
- Working Offline with GIT View

- How to create plots and figures with Plot.ly and import them into your Overleaf projects View
- How to publish your projects on Figshare to get an instant DOI View
- How to import your references from Zotero and CiteULike View
- How to setup an auto-backup using Overleaf → Dropbox → BitBucket (external) View

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Thank you!

www.overleaf.com | john@overleaf.com

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